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OF THE

AMERICAN DENTAL ASSOCIATION

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Root Canal Sterilization—*Ross*

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CLASSIFICATION AND ETIOLOGY OF PERIODONTAL DISTURBANCES

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CAREFUL clinical studies indicate that there are many different types of disturbances of the tissues surrounding and supporting the teeth. These involvements vary from acute inflammatory to chronic degenerative conditions, affecting perhaps one or two local areas, or perhaps all the teeth and surrounding structures. Often these periodontal disturbances are progressive, sometimes slowly, but occasionally rapidly destroying the entire tooth attachment apparatus.

Classification of these disturbances is of limited value because, by using different criteria to separate cases, it is possible to arrange them in many different ways. Also, attempts to include all the possible variations of periodontal disturbances result in a classification so complex and unwieldy that it is not useful. Nevertheless, successful treatment of these conditions depends on a knowledge of their etiology and on understanding how they can be differentiated. Therefore, a systematic analysis and classification of the many periodontal disturbances should prove helpful to those who are required to study and treat them.

DEFINITIONS

Because of the confusion that exists in the nomenclature of periodontology, a few definitions may be helpful. The system of nomenclature used in this paper is essentially the one accepted by the American Academy of Periodontology and recommended by the 1942 and 1943 Committee on Nomenclature of the American Dental Association. Actually, it matters little what arbitrary terms one selects to denote the various types and phases of these diseases, if the terms convey to the reader a clear picture of the clinical and pathologic processes under discussion. Whatever minor advantages there may be in such variations

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TABLE 1.—CLASSIFICATION OF PERIODONTAL DISTURBANCES

Acute

Tissues Involved	Gingivae	Periodontal Membrane (Alveolar Bone Secondarily)		
		Apical	Lateral	All
Reaction	Inflammation	Inflammation		
Nomenclature	Gingivitis	Acute apical periodontitis (acute alveolar abscess)	Acute lateral (periodontal) abscess	Acute periodontitis (pericementitis)
Etiology	Severe local injury (a) Mechanical (b) Chemical (c) Thermal (d) Bacterial Amount of damage resulting depends on (1) tissue resistance, (2) severity of irritant, (3) time	Bacterial (infection from infected pulp) Chemical (overmedication)	Acute infection in preexisting deep pathologic pocket	Severe local injury, mechanical, chemical
Clinical findings	Variations Gingiva tender Bleed easily Hyperemic Color, red or blue-red	Involved tooth, tender, elongated, some swelling of tissue over apex	(1) Swelling of soft tissue opposite pocket; (2) tooth tender to percussion; (3) suppuration (usually); (4) deep periodontal pocket present	Tooth slightly loose, tender to percussion
Roentgenographic findings	None	None (unless granuloma was preexisting)	None (except for deep pocket)	None
Pathology	Acute inflammation localized at gingival margin	Severe local inflammatory reaction (edema, hyperemia and perhaps presence of polymorphonuclear leukocytes, bacteria)		

as "paradentitis," "parodontitis," and "peridentitis," these advantages are overshadowed by the confusion which results when authors use different terminologies. For the sake of uniformity, if for no other reason, the use of the terms recommended by the Academy of Periodontology seems advisable. These terms use the Greek prefix "peri" and the Greek root form "odont."

The "periodontium" is composed of those tissues which surround and support the teeth; namely, the gingivae, periodontal membrane, alveolar bone and cementum. "Gingivitis" is by definition an inflammation of the gingival tissues; "periodontitis," an inflammatory reaction in the periodontium; "periodontosis," a degenerative breakdown of the periodontium.

CLASSIFICATION

There are so many classifications of periodontal disturbances in the literature that one hesitates to suggest another. However, modifications of and additions to any classification must be made from time to time as our knowledge increases. The classification presented here is essentially a modification of the one suggested by Orban, although made on a different basis. For the sake of completeness, most involvements of the periodontium are included, but some cases it will be difficult to fit into this or any classification.

Periodontal disturbances may be divided roughly into acute and chronic involvements, and subdivided according to the oral tissues involved and the tissue reaction most prominent. Details of this classification are given in Tables 1 and 2.

ACUTE PERIODONTAL DISTURBANCES

Acute periodontal disturbances (Table 1), which may involve the gingival margin alone, are called "gingivitis" because the most striking tissue reaction is inflammatory. The etiology of acute gingivitis is severe local injury. Examples are (a) mechanical injury (toothbrush trauma); (b) bacterial injury (Vincent's infection); (c) thermal injury (burns), and (d) chemical injury from drugs (acetyl salicylic acid).

The degree of pathosis resulting from these injuries depends on the severity of the injury, the length of time that the irritation has been active and the resistance of the tissue. The clinical picture varies, but usually the gingivae involved are tender, swollen, hyperemic or cyanotic. In Vincent's infection, ulceration, gray necrotic membrane formation and a typical odor may be noted. There are no roentgenographic findings. Microscopic study of the acutely involved tissue usually shows typical acute reactions — edema, engorgement of blood vessels, a collection of acute inflammatory cells and perhaps invasion of causative organisms.

The periodontal membrane may be acutely involved in many ways. Because the reaction is acute, the alveolar bone is little involved in the acute process. If the apical periodontal membrane fibers are inflamed, the condition is called acute apical periodontitis, and an acute alveolar abscess may develop. The cause is almost always bacterial invasion of the periapical tissues from an infected pulp, although chemical irritation from overmedication in root canal therapy can cause an acute periapical disturbance. Clinically, one finds the involved tooth tender and elongated, and the soft tissue over the apex may be tender and swollen. There are no roentgenographic findings associated with the acute reaction, although deep caries and perhaps a preexisting granuloma may be seen. Microscopic study of these cases reveals a severe local inflammatory reaction.

Occasionally, an acute disturbance is found in the lateral periodontal membrane, in the region of a preexisting pathologic pocket. The inflammation,

TABLE 2.—CLASSIFICATION OF PERIODONTAL DISTURBANCES

Chronic

Tissue Involved	Gingivae				Periodontium			
					1. Gingiva 2. Alveolar Bone, Periodontal Membrane		1. Alveolar Bone, Periodontal Membrane, Cementum 2. Gingivae	Secondary Involvement
Reaction	Inflammation		Atrophy	Hypertrophy	Inflammation		Degeneration or Atrophy	Usually Inflammation
Nomenclature	Gingivitis		Gingival Recession	Gingival Hypertrophy	Periodontitis (Simplex)	Periodontitis (Complex)	Periodontosis	Specific Names
	Local	Systemic						
Etiology	(1) Calculus (2) Faulty restoration (3) Poor contact area (4) Drugs (5) Poor oral hygiene, etc.	(1) Nutritional disturbances (2) Diabetes (3) Blood dyscrasia (4) Pregnancy (5) Drugs (6) Idiopathic, etc.	(1) Following gingivitis (2) Trauma (3) Senile (4) Disuse (5) Idiopathic	(1) May accompany gingivitis (2) Drug (dilantin sodium) (3) Leukemia (4) Dietary (5) Idiopathic	Similar to gingivitis except irritation is more severe or present for longer time	Similar to periodontosis; inflammation caused by same factor as periodontitis simplex	Systemic disturbances Nutrition Diabetes Endocrine dysfunction Idiopathic	(1) Periapical infection (2) Tuberculosis; syphilis (3) Tumors (4) Radiation, etc.
Clinical findings	Gingivae Bleed easily Swollen Red or blue-red No suppuration No pocket formation		Cementum exposed (sensitive) Clinical crowns elongated Gingivae usually thin, pale	Localized to one papilla, or generalized Gingivae often cover entire crown of tooth If inflammatory, bleeding; if not, dense, tough gingivae	Chronic gingivitis Much calculus, etc., teeth loose, pathologic pocket, suppuration	Same as periodontitis	Mouth often free of local irritation, usually affects anterior teeth and first molars; affected teeth loosen, migrate; bone resorbed	Varies Local bone loss

Roentgenographic findings	Pathology						
	None	Alveolar crest slightly blunted	None	Horizontal bone loss, pocket formation	Both	Periodontal membrane wider; vertical alveolar bone loss	Bone destruction usually localized
	Variations Usually gingivae show chronic inflammation, edema, hyperemia, subepithelial round-cell infiltration	Often no inflammation, no pocket formation	Variations If inflammatory, same as gingivitis If dilantin, fibrous tissue and epithelial growth If leukemia, accumulation of leukocytes If idiopathic, overgrowth of fibrous tissue of gingivae (fibromatosis)	Chronic inflammation progressing into alveolar bone; epithelium lining pocket proliferating but not intact	Same as periodontitis simplex, superimposed on those of periodontosis	Degeneration of connective tissue in periodontal membrane; bone resorption, widening of periodontal membrane Epithelial attachment grows apically Cementum not forming	Resorption of alveolar bone by osteoclastic action

caused by the action of bacteria, results in closing the pocket, so that drainage is stopped and an abscess forms. Clinically, one observes a tooth tender to percussion, with a deep pathologic pocket. Swelling of soft tissue opposite the pocket and some suppuration are present. Occasionally, a chronic draining sinus forms and this process becomes subacute. Roentgenographic examination will usually reveal a deep pathologic pocket along the involved tooth. The histopathologic findings are similar to those found in acute apical periodontitis, except for the deep pocket, with its disturbed crevicular epithelium.

If the local injury is severe, as that incurred in an auto accident or from overmalleting of gold foil, the entire periodontal membrane may be involved. This is called acute periodontitis or pericementitis. Clinical examination may reveal only a tooth tender to percussion and perhaps slightly loose. Roentgenographic findings are negative, although root fractures must be ruled out. Pathologic findings vary. Usually, edema and hyperemia are noted. Occasionally, there may be a fracture of the cementum, crushing of periodontal membrane fibers, thrombosis of blood vessels and perhaps a fracture of alveolar bone.

These acute conditions are seen often and their diagnosis and treatment do not usually present much difficulty.

CLASSIFICATION OF CHRONIC PERIODONTAL DISTURBANCES

The chronic periodontal disturbances are much more common and varied than the acute. It is possible to classify them also according to the tissues involved and the manner in which the tissues respond. Thus, the gingival tissues alone may be affected and the reaction may be inflammatory (gingivitis), atrophic (gingival recession) or hypertrophic (gingival hypertrophy). (Table 2.) (Hypertrophy is used to de-

note an increase in the bulk of gingival tissue, rather than in its specialized meaning, "increase in size of individual cells.") The entire periodontium may be involved, the gingivae first and then the alveolar bone and periodontal membrane, with a chronic inflammatory reaction. This condition is called periodontitis. If the tissue reaction is degenerative or atrophic, involving the alveolar bone, cementum or periodontal membrane first and the gingivae last, the condition is called periodontosis. In late stages of periodontosis, an inflammatory reaction is superimposed on the periodontosis and the condition is called periodontitis complex.

For the sake of completeness, another group of disturbances of the periodontium is included in which the structures around the teeth are secondarily involved. In this category are placed tumors on the jaws, tuberculosis, syphilis, red bone marrow hyperplasia, hyperparathyroidism, etc. It is usually easy to differentiate these conditions from the other chronic periodontal disturbances.

A chronic inflammatory reaction, gingivitis, may be caused by local irritation, as from calculus, faulty dental work, the presence of poor contact areas, the use of drugs, poor oral hygiene, etc. Rarely, certain systemic conditions, such as nutritional deficiencies, diabetes, blood dyscrasia and pregnancy or the use of drugs may so lower gingival resistance to infection and injury that even mild irritation results in a severe gingivitis. The clinical findings vary. Usually, the gingivae are swollen and bleed easily and are hyperemic or cyanotic. There is no suppuration, no pocket formation and no roentgenographic evidence of pathosis, and the histopathologic picture shows chronic inflammation of the gingival tissues.

Atrophy of the gingivae, gingival recession, may follow chronic gingivitis, trauma, disuse and changes occurring with senility. Occasionally, no explanation can be found for the recession. These cases may be called idiopathic, although usually a more careful study of the case will reveal a local irritant which has caused the recession. Clinical examination reveals that the gingivae were pale and thin, with recession exposing the cementum and the clinical crown elongated. When recession accompanies gingivitis, the gingival tissue is inflamed. The histopathologic changes vary. Often, no pocket formation and no inflammation are noted. The roentgenogram shows only a slight blunting of the alveolar crest.

Gingival hypertrophy may accompany gingivitis or may be caused by some systemic condition, such as leukemia, nutritional disturbance, the ingestion of dilantin sodium and perhaps the use of other drugs. Idiopathic gingival hypertrophy (fibromatosis) is occasionally seen.

The clinical findings may be localized to one gingival papilla or many. The hypertrophic tissue may be soft, edematous and hyperemic, or dense, firm and fibrotic. The roentgenogram shows no change in the teeth or alveolar bone. Microscopic findings in the hypertrophic tissue may be similar to those in gingivitis, or may reveal dense fibrous tissue and epithelial growth. In hypertrophy associated with leukemia, an accumulation of leukocytes or lymphocytes will be seen in the tissue.

CHRONIC INVOLVEMENT OF THE PERIODONTIUM

Inflammatory involvement of the periodontium, "periodontitis," usually follows gingivitis. (Table 2.) The reaction proceeds from the gingivae to the bone, and the periodontal membrane and cementum are involved later.[3]

The etiology is similar to that of gingivitis, except that the irritation is more severe and present for a longer period of time. In addition, the local tissue resistance may be poor, allowing the

inflammatory process to proceed more rapidly.

The clinical picture is familiar to every dentist. A chronic gingivitis is present; teeth are loose; there are deep pockets, and often much suppuration is noted. Many teeth are involved, and the roentgenogram shows a horizontal type of bone loss. Microscopic study shows a chronic inflammation of the gingivae with edema and hyperemia. Epithelium lining the deep pocket is proliferating, but not intact.

In periodontosis, the inflammatory reaction is absent. Apparently the first change is in the alveolar bone (although it has not been disproved that the cementum or periodontal membrane may be first involved) so that the tooth attachment apparatus is weakened by the detachment of periodontal membrane fibers. Periodontosis is more common in women and is usually noted in the second decade of life. Clinical examination often reveals a mouth well cared for, free of calculus and caries. The gingival tissues usually are of normal contour and color. The first change noted will be migration and loosening of one or two teeth. Roentgenograms will reveal deep vertical pockets and a periodontal membrane wider than normal. This condition usually affects the upper anterior teeth, then the first permanent molars, perhaps because these teeth erupt first. The affected teeth often have thin roots with proportionately large crowns.

Microscopic studies of periodontosis in the early stages are few. The case described by Orban and Weinmann[4] shows degeneration of the connective tissue elements of the periodontal membrane, alveolar bone resorption, widening of the periodontal membrane and the epithelial attachment growing apically.

The etiology of periodontosis has not been studied thoroughly. Apparently, some systemic disturbance, such as vitamin A, B, C or D deficiency, diabetes and endocrine dysfunction, weakens the tooth attachment apparatus, so that local forces cause individual teeth to migrate. Once this process has started, it continues. A pathologic pocket forms, calculus and infection complicate the picture and finally the case clinically resembles one of periodontitis. Such conditions are called periodontitis complex, and the cases present certain roentgenographic and pathologic findings of both periodontosis and periodontitis simplex.

The last group to be considered in the involvement of the periodontium should be labeled "miscellaneous." In this group are placed all the general diseases or secondary involvements of the periodontium, which are seldom confused with periodontitis or periodontosis. Cases are seen wherein teeth have become loose because of irradiation necrosis, tumors, syphilis, tuberculosis, etc. Periapical granulomata and cysts, which also involve the periodontium, are included in this group of chronic periodontal disturbances.

Often a case will be seen which combines aspects of more than one group. However, we believe that this classification includes all the common involvements of the periodontium and should be an aid in the analysis of periodontal disturbances.

ETIOLOGY OF PERIODONTAL DISTURBANCES

Periodontists generally concede that the etiologic factors of periodontal disturbances can be divided into two large groups; namely, local irritations and systemic disorders. Actually, all cases present a combination of factors from both groups. Some cases show little tissue reaction to rather severe local irritation because the tissues involved have good resistance; while, in other cases, mild local irritation inflicted upon tissues weakened by some systemic disorder may result in a serious involvement. Because

TABLE 3.—ETIOLOGIC FACTORS IN PERIODONTAL DISTURBANCES*

Local (Exciting) Factors, Influenced and Modified by		→ Predisposing (Environmental) Factors	→ Periodontal Disturbances
	Oral	Systemic	
1. Deposits on teeth	1. Local tissue resistance	1. Physiologic age	1. Gingivitis
(a) Materia alba	(a) Stimulation from mastication	2. Sex	2. Periodontitis
(b) Calculus	(b) Artificial stimulation (oral hygiene)	3. Heredity	3. Periodontosis
2. Food impactions	(c) Physical character of diet	4. Nutrition	4. Periodontitis complex
(a) Abnormal contact areas from (1) malocclusion, (2) dental caries, (3) poor restorations, (4) contact wear	(d) Blood supply	(a) Deficiency	
3. Irritating margins	2. Saliva	(1) Vitamins (A, B complex, C or D)	
(a) Restorations	(a) Viscosity and quantity	2. Minerals (Calcium, deuterium, magnesium, iron)	
(b) Caries	(b) Effects on oral flora	(b) Excess	
4. Abnormal occlusal stress	(c) Factor in calculus formation	(1) Proteins (?)	
(a) In direction	3. Oral anatomy	(c) Acid-base balance	
(b) In amount	(a) Tooth contour	5. Endocrine dysfunction	
(c) Poor dental work	(b) Arrangement of teeth	6. Pregnancy (?)	
5. Habits		7. Blood dyscrasia	
(a) Bruxism		8. Debilitating disease	
(b) Chewing habits		9. Psychic disturbance	
(c) Tongue habits		10. Allergy	
(d) Mouth breathing		11. Unknown	
6. Bacteria			
(a) Anaerobic			
(b) Aerobic			
(c) Leptotrichia			
7. Chemical irritations			
(a) Mouth rinses			
(b) Drugs			
8. Trauma			
(a) Toothbrush			
(b) Toothpick			
9. Miscellaneous			
(a) Smoking			
(b) Clasps, etc.			
10. Unknown			

*Amount of disturbance produced depends upon (1) severity and duration of local irritation and (2) tissue resistance.

more than one causative factor is usually involved, searches for the etiologic factor have failed.

Tissues can react to injury in only a limited number of ways—atrophy, degeneration, hypertrophy, inflammation, necrosis, etc. The causes of these reactions, however, are many, and examination of the tissue alone will not identify positively the type of irritation inflicted on the tissue. Obviously, successful treatment must be based upon the cause of the tissue reaction rather than the tissue reaction itself. Symptomatic treatment of periodontal disturbances is of limited value.

The number of conditions believed to cause periodontal disorders is legion. Blessing (cited by Becks[5]) has listed 350 different conditions which might cause periodontal disturbances. Rather than present such a lengthy list, we have grouped and classified most of the etiologic factors in a table. (Table 3.)

Several years ago, it was customary to express the etiology of a disease by the use of a mathematical formula. It is realized that disease processes cannot be reduced to simple mathematics, but such formulae often help clarify and organize the information available. Thus, it may be said that local (exciting) conditions influenced by predisposing conditions result in periodontal disease. The predisposing conditions may be subdivided into oral and systemic.

LOCAL CONDITIONS

The local conditions responsible for periodontal disturbances may be grouped as follows:

1. Deposits on teeth.
   (a) Materia alba.
   (b) Calculus (supragingival and subgingival).
2. Food impactions.
   (a) Abnormal contact areas
      1. Dental caries.
      2. Poor dental work.
      3. Malocclusion.
      4. Interproximal wear.
   (b) Abnormal tooth contour.
      1. Wear (as of cingulum).
      2. Poor restoration.
   (c) "Plunger" cusps.
3. Irritating gingival margins.
   (a) Dental caries.
   (b) Dental restorations.
4. Abnormal occlusal stress.
   (a) Abnormal in direction.
   (b) Excessive in amount.
   (c) Due to poor dental restorations or malocclusion.
5. Habits
   (a) Bruxism.
   (b) Tongue habits.
   (c) Chewing habits (toothpick, pipe, etc.).
   (d) Mouth breathing.
6. Chemical irritation.
   (a) Mouth rinses.
   (b) Drugs such as arsenic, phosphorus, mercury.
7. Bacteria.
   (a) Anaerobic (in Vincent's infection).
   (b) Aerobic (streptococci, staphylococci) urease-producing organisms.
   (c) Leptotrichia (nidus for calculus?) (produces phosphatase?)
8. Trauma.
   (a) Improper use of toothbrush.
   (b) Improper use of toothpick, etc.
9. Miscellaneous (irritation from radiation therapy, denture clasps, etc.)
10. Unknown

PREDISPOSING CONDITIONS

Predisposing conditions may be oral or systemic, as follows:

Oral.

1. Local tissue resistance.
   (a) Stimulation from:
      (1) Mastication (important force in development).
      (2) Physical character of diet.
      (3) Artificial care (toothbrush, etc.).
      (4) Blood supply.
   (b) Oral hygiene.
2. Saliva.
   (a) Viscosity and quantity.
   (b) Effect on bacterial growth.
   (c) Factor in calculus formation.
3. Oral anatomy.
   (a) Arrangement of teeth.
   (b) Contour of teeth.

Amount of disturbance produced depends upon (1) severity and duration of local irritation and (2) tissue resistance.

Systemic.

1. Physiologic age of patient.
2. Sex.
3. Heredity.
4. Nutrition.
   (a) Deficiency.
      (1) Vitamin (A, B complex, C, D).
      (2) Mineral (calcium, phosphorus, magnesium).
   (b) Excesses (proteins?).
   (c) Acid-base balance.
5. Endocrine dysfunction.
   (a) Diabetes, hypothyroidism, hyperthyroidism, hypoparathyroidism, hyperparathyroidism, etc.
6. Pregnancy (?).
7. Blood dyscrasia:
   (a) Anemia, granulocytopenia, purpura, etc.
8. Debilitating diseases (tuberculosis, nephritis, influenza).
9. Psychic disturbances.
10. Allergy.
11. Idiopathic ("molting of cementum"?).

All of the above-mentioned conditions have been accused of causing periodontal disturbances and doubtless all of them can. The type of disturbance which results will depend on the kind and degree of irritation, the time it is in effect and, of course, the ability of the tissue to withstand the injury. Thus, gingivitis, periodontitis, periodontosis or periodontitis complex may result.

TABLE 4.—EXAMINATION FOR PERIODONTAL DISTURBANCES

Oral	Systemic
A. Gingiva	A. Age and sex
Color	
Contour	B. General health
Tone	
B. Oral hygiene	C. Diet
	Minerals
C. Mobility of teeth	Vitamins
Palpation	
Under stress	D. Laboratory tests
	Blood chemistry
D. Periodontal pockets	Serum calcium and phosphorus
Depth	Serum proteins
Contents	Non-protein nitrogen
	Blood count
E. Roentgenogram	Hemoglobin
Height of alveolar bone	Cevitamic acid
Character of alveolar bone	Urinalysis
	E. Special tests
F. Contact areas	Basal metabolism, etc.
Under stress	
G. Occlusion	
In function	
H. Habits	

When one remembers that one, two or any combination of these various local and predisposing conditions may be responsible for periodontal disease, it becomes apparent that each case must be studied with care if satisfactory results are to be obtained. Treatment of all cases by simple removal of deposits from teeth or by giving vitamin C or by correction of any other one condition is not adequate.

METHOD OF EXAMINING THE MOUTH FOR PERIODONTAL DISTURBANCES

Obviously, it is impractical to study every patient with periodontal disturbances to see if all these conditions are contributory. The following procedure can be recommended:

1. Examine the mouth of each patient with care, and remove or correct all local exciting conditions.

2. If the results are unsatisfactory or the periodontal disturbance cannot be explained by oral findings, predisposing conditions should be more thoroughly investigated.

A suggested outline for examination for periodontal disturbances is given in Table 4. The oral examination is made with care, noting even slight deviations from the normal color, contour or tone of the gingival tissues and the cause of the disturbance sought. The care the mouth is given by the patient is discussed at this time. The mobility of each tooth is tested, particularly under functional stress.

The depth of each periodontal pocket is recorded and a note made of the character of its contents. A blunt periodontal membrane explorer can be used to measure the depth of the pocket and also to remove a sample of the contents of the pocket. If even slight suppuration persists in the pocket, the treatment of the case cannot be considered complete.

Roentgenographic findings are usually more extreme than clinical findings because the alveolar bone is often resorbed in advance of pocket formation. For this reason, clinical and roentgenographic studies must be correlated.

Contact areas and the occlusion are carefully examined, particularly under stress. Often, a contact will open in function and close again as the mouth opens. Food fibers are caught frequently in such contact areas and gingival trauma results. Finally, the examiner looks for evidence of abnormal habits. Frequently, unusual habits, such as a policeman's biting a metal whistle, may result in periodontal involvements.

In addition to oral conditions, the patient's age, sex and general health should be noted. A few questions should be asked concerning the diet and some general suggestions made. Routine treatment may then be given, and the response to this treatment carefully checked. If the case fails to respond as it should, more detailed systemic studies are indicated, and the patient should be referred to a physician for examination. The diet should be thoroughly studied and laboratory tests made to rule out diabetes, anemia, vitamin C deficiency or any other systemic disorder. In some cases, definite systemic disturbances interfering with the treatment of periodontal involvements may be found.

The etiology of periodontal disturbances may be chiefly local irritation, or may be a complex combination of local and systemic conditions. Satisfactory treatment of these cases will be possible only after a careful analysis of the etiologic factors has been completed.

BIBLIOGRAPHY

1. ORBAN, BALINT: Classification and Nomenclature of Periodontal Diseases. *J. Periodontol.*, 13:88, 1942.

2. BLAYNEY, J. R.: Hypertrophic Gingivitis. *Angle Orthodontist*, 3:139, 1933.

3. WEINMANN, J. P.: Progress of Gingival Inflammation. *J. Periodontol.*, 12:71, 1941.

4. *Idem:* Diffuse Atrophy of Alveolar Bone. *J. Periodontol.*, 13:31, 1942.

5. BECKS, HERMANN: Background of Paradentosis. J.A.D.A., 28:1447, September 1941.

6. LEOF, MILTON: Clamping and Grinding Habits: Their Relation to Periodontal Disease. J.A.D.A., 31:184, February 1, 1944.

7. BOENHEIN, FELIX: Importance of Endocrine Glands in Paradontal Disease. *J. D. Res.*, 17:19, February 1938.

PHYSICAL PROPERTIES OF AMALGAM AS INFLUENCED BY THE MECHANICAL AMALGAMATOR AND PNEUMATIC CONDENSER

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IT is a well-known fact that amalgam is more susceptible to human variables than any other material used in dentistry. Everything that is done during the manipulation, packing and finishing of amalgam has a definite effect on the resulting physical properties and thus the success or failure of the restoration. In a recent survey of about twenty amalgams made at Indiana University School of Dentistry, it was found that there were very few definitely inferior alloys and that the top eight or ten were almost on a par. So the great majority of amalgam failures seen daily must be attributed, not to the use of a poor alloy, but to the improper use of a good alloy.

Much excellent work has been done to standardize amalgam technic. Investigators have for many years attempted to reduce the variables in amalgam manipulation, and it would be an endless task to cite the literature. However, aside from the variables governed by the manufacturer such as composition, particle size and annealing time, the two greatest variables that are the direct responsibility of the dentist himself are trituration and packing of the alloy. It is common knowledge that even in employing the most exacting technics and following the manufacturer's directions explicitly, differences in the human element are so great that wide variation in physical properties may result. Recently, however, there have been developed to an apparent state of perfection mechanical devices for mixing and condensing the alloy. Naturally, this has led to the supposition that possibly these mechanical means for manipulation would do much to eliminate the human variables, improve the quality of the fillings and truly standardize our technic.

Not much work has yet been done as to the effect of use of the mechanical amalgamator and pneumatic condenser upon the physical properties of amalgam. Since many dentists are now employing these devices, it seems of vital importance to find out whether in the resulting physical properties, these fillings are superior or inferior to hand manipulated fillings. In reviewing the investigations that have been conducted, I have been impressed by three facts: 1. The various reports are very conflicting, and consequently one is confused as to which research is to be used as the criterion. 2. Most of the work done was conducted on only one or two alloys. Results obtained on one alloy do not permit one to deduce that all other alloys will behave in the same way. It seems that an investigation should cover a large number of alloys and then indicate whether any general trends for all amalgams could be observed. 3. Almost all investigators have suggested that their findings, whether clinical or laboratory, be corroborated by other workers.

From the Indiana University School of Dentistry.

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Thus the purpose of this research was to learn the general effect of use of the mechanical amalgamator and pneumatic condenser upon alloys now on the open market.

LABORATORY PROCEDURES

Twenty popular commercial alloys, purchased on the open market, were tested for their physical properties under various methods of manipulation; namely, (1) mixing by the mortar and pestle according to the manufacturer's directions, packing by hand; (2) mixing by the mechanical amalgamator, both with and without the steel pellet, packing by hand; (3) mixing by the mechanical amalgamator, packing by pneumatic condenser, using two different settings for the hammer blow.

Fig. 1.—Mechanical amalgamator and pneumatic condenser used in author's investigation.

In an early revised specification, the compressive strength was deleted. This was done because alloys which passed the flow and setting change tests would invariably meet the low crushing strength requirement of 35,000 pounds per square inch. It appears to me, however, that some valuable features of amalgam may be learned by a study of the compressive strength, for on it depends the freedom from breakage, especially in the early stages. An alloy should not only have a high compressive strength after twenty-four hours, but also should gain its strength fast so that breakage will not occur with early use of the restored tooth. Since some alloys may be sufficiently strong after twenty-four hours, yet gain that strength so slowly that they easily break at an early stage if stress is applied, both twenty-four-hour and one-hour crushing strengths were obtained, for comparison of strength with various manipulations. All tests were made with equipment and procedures as required in A.D.A. Specification No. 1 for Testing of Dental Amalgam. The temperature of the room during testing was held at 20-25° C.

Although the methods employed were both exacting and scientific, an attempt was made to use procedures that would compare favorably with their practical application in dentistry. Ofttimes, similar investigations are carried out under conditions that it is impossible to duplicate in a dental office. I felt that the results found here should be comparable to those which an exacting dentist would obtain when employing these mechanical devices in his office. Figure 1 shows the mechanical amalgamator and pneumatic condenser which were used.

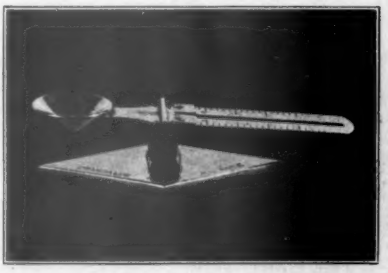

Fig. 2.—Balance used to weigh alloy and mercury. This type is sufficiently accurate both for this investigation and for use in the dental office, when properly handled.

The alloy and mercury were weighed by means of the balance shown in Figure 2. Since it was desired to eliminate any variables that might be due to the mercury : alloy ratio, the accuracy of this scale

was determined. Four different samples of alloy and mercury were weighed, the same setting being used each time and the scale balanced as accurately as possible by the naked eye. These samples were then weighed on an analytic balance. The results are seen in Table 1. The percentage of deviation from the average weight is shown for each sample. The greatest variance for the alloy was 1.8 per cent and only 0.6 per cent for the mercury. Consequently, this balance, when handled properly, seems sufficiently accurate for use in this investigation and also in the dental office.

Since different batches of the same alloy will vary somewhat from time to time, tests made to determine the physical properties will also yield slightly different results for each particular batch. Likewise, I realize, as do other investigators, that even under the most controlled type of testing, a certain amount of experimental error will develop. Consequently, in order to compensate for variations which might be due to use of different batches and also for any experimental error, I have allowed various tolerances in interpreting the data. Owing to the lack of any clinical evidence in support of the application of small dimensional change or flow variables or even evidence that an amalgam must expand to fall within the limits of the specification (3 to 13 microns per centimeter) to be satisfactory, I deemed it advisable to consider results identical if they were reasonably close.

The same size condensing point was used in both hand and mechanical condensing, 2.5 mm. in diameter with smooth surface. This size was merely taken arbitrarily, since we are not interested in the effect of the size of the point on the physical properties, but only interested in assuring that the same size be used on all specimens.

It must be kept in mind that we are considering the effects of the various methods not on one particular alloy alone, but instead as a composite picture of all alloys, the purpose being to see whether any general trend can be stated for amalgams as a group, not just for one particular brand of alloy.

TABLE 1.—ACCURACY OF BALANCE USED IN INVESTIGATION*

Alloy Weight Gm.	Deviation from Average Per Cent	Mercury Weight Gm.	Deviation from Average Per Cent
No. 1 1.5003	1.2	No. 1 2.8671	0.4
No. 2 1.5455	1.8	No. 2 2.8625	0.6
No. 3 1.5257	0.5	No. 3 2.8964	0.6
No. 4 1.5002	1.2	No. 4 2.8932	0.5
Av. 1.5179		Av. 2.8798	

*Four separate samples of alloy and mercury have approximately the same weight when weighed analytically.

MECHANICAL AMALGAMATOR

The first report submitted on mechanical amalgamation was by Taylor[1] in 1929. He, at that time, expressed an unfavorable opinion and suggested that they be standardized. With the later type of instrument, Cannon,[2] in 1936, advocated its use, although Tingley[3] shortly after was not in favor of that type of mixing. The first definite statement as to the effect on physical properties was made by Sweeney[4, 5] aided by Skinner, who found that the combined use of the mechanical amalgamator and the pneumatic condenser increased the crushing strength 43 per cent, expansion was normal, tensile strength increased 44 per cent and flow was reduced 50 per cent. About 200 fillings placed by this technic

seemed to be superior in the mouth as observed clinically. Romnes[6] advocates both devices for standardizing the technic, as does Hollenback[7] and Kilpatrick,[8] who compared restorations clinically. However, McCauley[9] reports that unless the mix is finished by mulling in the hand, the fillings are of less strength and flow more. Consequently, the data so far printed are not entirely adequate and are conflicting as to the effect on the physical properties of use of the amalgamator.

Two types of capsules for mixing the amalgam are supplied with this instrument, plastic and metal. The metal capsule was used in all tests and was thoroughly cleaned after each mix. Although an automatic timing device is attached, few manufacturers state the proper time for mixing their alloy with the mechanical amalgamator. Consequently, I was forced to go entirely by the appearance of the alloy rather than by the timing device. Naturally, the time of mixing in the amalgamator will vary for each alloy and for the size of the mix. Most alloys are thoroughly triturated in from ten to fifteen seconds with fairly large mixes, but some others, especially those with a low mercury : alloy ratio, take twenty or thirty seconds even when the size of the mix is reduced. For these alloys that required long periods of time for trituration, the size of the mix was reduced and several mixes used for packing the specimens.

Thus, each alloy was mixed until it had the same appearance as when triturated in the mortar and pestle according to the manufacturer's directions. Although this does involve individual judgment, appearance is the only means by which we can compare the two methods. I am sure that the best properties of many alloys are not brought out by following the manufacturer's directions, but, at the present time, that is the only criterion which the dentist has. The purpose of this investigation is not to point out the ideal technic for each alloy, but rather to compare these various methods as they are employed today in the dental office.

I have found that more uniform mixes can be obtained if one relies upon the sound made by the pestle as the mechanical mixer is in motion than by using the automatic timing device. It is impossible, when using the amalgamator, to standardize the time for a certain alloy even with a given amount of alloy and mercury, since, it was found, the time required to obtain a given consistency will vary from mix to mix. However, if the steel pellet is used, the moment that the clicking sound of the pellet against the steel capsule is no longer heard is the time at which to stop the trituration. When stopped at this point, the amalgam will always have a uniform consistency. With only a little experience, this point is easily detected and is a much more reliable means for obtaining uniform mixes than the timing device.

None of the specimens were mulled in the hand after removal from the capsule. Although the manufacturers of the mechanical amalgamator state that the steel pellet should always be used as a pestle, it has come to my attention that some dentists are mixing the alloy without the use of the steel pellet. Therefore, the physical properties of the various alloys were compared in mixing with and without the steel pestle. All specimens were packed by hand, using approximately 4 pounds pressure. It was found that only two alloys had their dimensional change increased by more than 3 microns when mixed without the steel pestle, only two contracted more than 3 microns and the remainder had the same amount of dimensional change for both methods. However, twelve of the alloys had an increased flow over 0.5 per cent when mixed without the pestle. Also, eighteen of the twenty showed a decrease of more than 1,000

pounds in their one-hour crushing strength when mixed without the pestle. Only two showed any increase in twenty-four hour crushing strength, although six definitely decreased. Thus, these results seem to indicate the same amount of dimensional change, but more flow and a loss of strength when mixing without the steel pellet. This would bear out my observation that these mixes did not seem to be so well triturated as did those when the pestle was used. Thus, I think it imperative that the steel pellet be used, to assure greater strength in the amalgam.

Having thus established the proper procedure for employing the mechanical amalgamator, we are ready to compare this with the mortar and pestle, again packing all specimens by hand. A No. 8 mortar was used and the manufacturer's directions were followed as nearly as humanly possible. Alloys were mulled only when directions so specified. Table No. 2 shows the various methods of mixing for each alloy, as well as the time required to triturate the same size batch in the mechanical amalgamator. It is interesting to note how many manufacturers still advocate mulling in the hand although the disastrous effects of moisture contamination are now well known. Also, it is no wonder that twenty different sets of instructions for twenty different alloys leads to confusion of the dentist.

As indicated in Table 3, fourteen of the alloys showed less expansion when mixed by the mechanical amalgamator, while none showed more expansion. From these data, it appears that the amalgamator tends to triturate the alloy

TABLE 2.—METHODS OF MIXING ALLOYS ACCORDING TO MANUFACTURER'S DIRECTIONS; TIME REQUIRED TO MIX SAME SIZE BATCH IN AMALGAMATOR*

Alloy	Proportions		Mortar Mix			Mull	Time in Mechanical Amalgamator
	Alloy	Mercury	Time	Revolutions per Minute	Pressure Pounds		
A	5	8	1′	200	2	—	16″
B	6	8	1′	170	Light	2′	30″
C	5	8	1′	150	Stir	2′	17″
D	5	8	50″	200	Light	1′-1½′	37″
E	5	10	1′	150	1	¾′-1′	8″
F	3	5	1′	150	1	45″	7″
G	4	6	45″	Rapid	Grind	45″	24″
H	5	8	1′	120	4-5	30″	19″
I	5	8	1½′-2′	160	4	—	13″
J	6	8	1′	220	—	—	45″
K	5	10	45″-50″	200	2-3	—	13″
L	5	8	1′	150-200	½	—	19″
M	5	9	1′	100	—	1½′	14″
N	5	7	1′-2′	125	9	—	30″
O	5	10	1′	150	¼	—	4″
P	5	8	1′	120	3-4	30″	14″
Q	5	8	2′	150	Light	—	15″
R	5	8			3-4	—	15″
S	5	8	1½′	200	2	10-20 times	13″
T	6	9	1′	200	—	—	30″

*For alloys which required a long time, the size of the mix was reduced and several mixes used to pack specimens. The directions shown here do not necessarily mean that this is the best method, but is the one recommended by the manufacturer.

more thoroughly. It is to be noted that only two of the twenty, made by the same manufacturer, expanded enough to pass the specification of 3 to 13 microns per centimeter when mixed with the amalgamator. However, whether this contraction is great enough to prove such a restoration to be clinically inferior is still a matter of speculation. As I reported last year,[10] the degree of contraction was so minute that it could not be detected clinically after one year.

From Table 4, it is seen that ten alloys had their one hour crushing strength increased more than 1,000 pounds, and only two lost in early crushing strength. In considering twenty-four-hour crushing strength, fifteen alloys gained and only two decreased by employing the amalgamator. The gain in twenty-four-hour crushing strength was noted in some cases, as in alloys J, S and T, to exceed 5,000 pounds per square inch, or approximately 15 per cent. Again, in Figure 4, we can see graphically the tendency for a large percentage of the alloys to increase in crushing strength in employing the amalgamator. Thus, the mechanical amalgamator gives greater crushing strength, but increased percentage of flow. This again seems to indicate that longer trituration will produce more strength, more flow and less ex-

TABLE 3.—EXPANSION AND FLOW COMPARISON WITH AMALGAMATOR AND MORTAR AND PESTLE*

Alloy	Expansion†		Flow—Per Cent	
	No. 1‡	No. 2	No. 1	No. 2
A	— 5.25	— 1.1	2.75	2.62
B	— 2.25	+ 0.6	3.9	2.42
C	+ 0.75	+ 0.6	3.8	6.5
D	— 2.0	+ 6.4	6.0	4.3
E	— 4.25	— 2.25	1.6	2.3
F	— 5.0	— 5.3	7.12	3.9
G	+ 0.75	+ 6.0	3.5	2.62
H	— 5.75	+ 5.9	5.2	4.6
I	+ 5.25	+10.6	5.45	2.9
J	0	+ 5.2	3.4	2.0
K	— 1.5	+ 4.0	3.0	2.6
L	+ 0.25	+ 6.1	4.0	3.0
M	— 2.0	— 0.5	3.75	2.2
N	—18.0	— 7.8	4.2	2.2
O	— 2.0	+ 3.4	2.8	2.5
P	— 0.5	+ 4.6	2.1	1.52
Q	— 0.5	+ 2.0	2.9	2.25
R	— 3.0	+ 3.1	2.8	3.0
S	+ 8.8	+10.0	4.0	3.7
T	— 0.25	+ 5.2	4.7	3.48

*All specimens packed by hand.

‡No. 1: Mechanical amalgamator with steel pestle. No. 2: Mortar and pestle by manufacturer's directions.

†Microns per centimeter.

Thirteen of the alloys showed increased flow over 0.5 per cent when mixed by the amalgamator and only two showed decreased flow. A composite picture of the effect of the mechanical amalgamator is illustrated by Figure 5. As seen here, 65 per cent of the twenty alloys showed decreased expansion and a similar number showed increased flow.

pansion. This is substantiated by Ward and Scott[11] and others.

In regard to this increased percentage of flow, all but six of the alloys still pass the specifications of not more than 4 per cent after twenty-four hours in employing the mechanical amalgamator. Even in mixing in the mortar and pestle by the manufacturer's directions, three alloys failed to pass the specification. It is my belief that evidence of flow is not often observed in the mouth. Undertriturated fillings having a flow as high as 6.5 per cent when placed in the mouth gave no evidence of flow even though

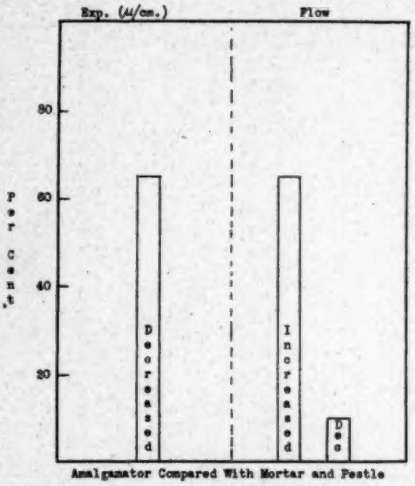

Fig. 3.—Percentage of twenty alloys the physical properties of which are altered.

subject to heavy occlusal stress.[10] Proper cavity preparation with the bulk of amalgam where needed will offset minor increases of flow over the specifications. This coincides with the findings of Sweeney[12] of no clinical evidence of flow even on employing methods which produced high flow in laboratory tests. Unfortunately, our methods for testing flow are static and the restorations in the mouth are subject to dynamic force. This is pointed out by Skinner,[13] who states that consequently laboratory data on flow are final only after being verified by clinical observations. Thus, this tendency of the mechanical amalgamator to decrease the expansion and increase the flow, when within reasonable limits, may not be grounds to condemn its use, as we do not yet have sufficient evidence to prove how disastrous this actually is as far as either decreased expansion or increased flow is concerned.

At first thought, the primary advantage of the mechanical amalgamator over the mortar and pestle, other than its time-saving quality, would seem to be the fact that it might consistently

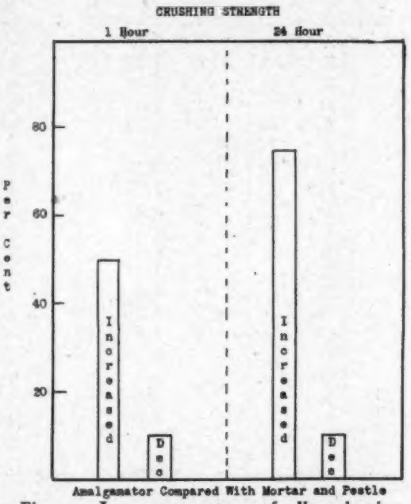

Fig. 4.—Large percentage of alloys having increased crushing strength when amalgamator is employed.

produce more uniform mixes than trituration by hand. In triturating amalgam in the mortar and pestle, many conditions will govern the properties of the resulting mix, such as the pressure of the pestle, size of the mix, speed of trituration and type and surface of the mortar. All of these conditions vary from day to day even under the most exacting of technics. Thus, individual tests made for physical properties may differ markedly in following the manu-

facturer's directions. It seems, therefore, that more uniform mixes could be made by employing a method that eliminates those variables to a great extent. The physical properties of four separate specimens were tested to determine any difference in uniformity in employing the mortar and pestle or the amalgamator. With the same alloy used throughout, everything was duplicated as nearly as possible in each case. In using the mechanical amalgamator, the greatest difference in dimensional change found in the four separate tests was only 2 microns, but when the mortar and pestle was used, the variation from lowest to highest was 4 microns. For flow, with the mechanical amalgamator, the maximum variation was 0.57 per cent against 1.05 per cent for the mortar and pestle. In testing the one-hour crushing strength, two samples for the amalgamator varied by 1,200 pounds, but the variance was 2,000 pounds with the mortar and pestle. Finally, for the twenty-four-hour crushing strength, I found a maximum variation of 1,700 pounds as compared with 2,700 pounds. Tests made with other alloys behaved similarly. Consequently, it is seen that, by using the amalgamator, we can more consistently obtain uniform mixes than by use of the mortar and pestle, even in an exacting and a controlled manner.

TABLE 4.—CRUSHING STRENGTH COMPARISON WITH AMALGAMATOR AND MORTAR AND PESTLE*

Alloy	Crushing Strength			
	1 Hour		24 Hour	
	No. 1	No. 2	No. 1	No. 2
A	11,400	10,000	47,500	43,800
B	16,900	16,400	48,700	50,700
C	17,400	17,600	50,900	48,900
D	13,000	11,100	48,600	48,400
E	9,300	11,700	45,900	44,800
F	8,900	8,800	42,300	40,100
G	17,900	16,800	49,900	49,100
H	11,600	10,200	49,400	42,700
I	11,900	11,400	48,100	47,000
J	16,000	15,200	50,800	44,800
K	11,800	12,600	46,500	43,700
L	11,600	10,300	45,600	43,900
M	18,000	16,700	48,100	49,000
N	12,600	11,200	53,000	47,900
O	9,300	8,700	44,000	42,000
P	11,000	13,500	49,800	48,500
Q	13,200	12,000	46,000	48,500
R	10,900	8,900	51,900	46,700
S	11,600	11,700	49,400	43,900
T	15,800	13,000	49,800	44,100

*All specimens packed by hand.
No. 1: Mechanical amalgamator with steel pestle. No. 2: Mortar and pestle by manufacturer's directions.

PNEUMATIC CONDENSER

In reviewing the literature for work that has been done on the pneumatic condenser, I have found, in addition to the work of Sweeney already mentioned,

that Shepherd,[14] Kilpatrick[8] and Tingley [15] all advocate its use. Unfortunately, again we have very few data as to the effect upon the physical properties of amalgam. In this part of the investigation, fifteen alloys were tested for all the physical properties, with the Hollenback pneumatic condenser. Since we have found that the mechanical amalgamator produces more nearly uniform mixes, all specimens were triturated by that method to standardize this element. The straight condenser was used on all specimens and the condenser point was Dr. Cannon's No. 4, which is 2.5 mm. in diameter, being equivalent to Black's No. 2 plugger and of the same diameter as the instrument that I used when hand packing. Since the directions state that the condenser should be run at from 250 to 500 blows per minute, the instrument was set at 400 blows per minute for all the specimens. Further work could be done to observe any effect from varying the speed of the condenser.

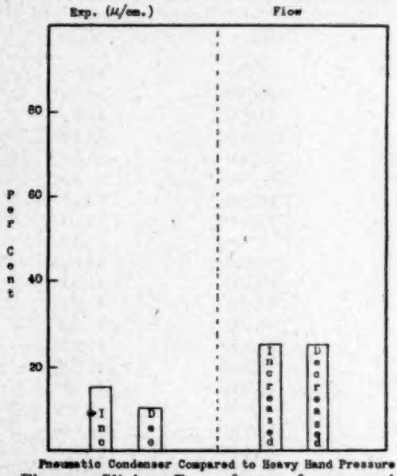

Fig. 5.—Slight effect of use of pneumatic condenser on major portion of alloys in consideration of dimensional change and flow.

The method of packing was the same as for the hand packing tests, starting with a somewhat wet portion of alloy and packing with increasing dryness. The last amalgam to be packed was wrung thoroughly dry in a hand towel, with only hand pressure. I did not test the properties in packing by a dry amalgam technic as is advocated by certain men.

I feel that one of the primary considerations in the testing of the condenser should be a measurement in some way of the magnitude of the blow in using different settings of the needle valve. The weight of this blow can be increased considerably by opening the valve, and there should be a method to measure this force if one is to compare it with hand pressure. The directions state only that a comparatively light blow should be used and that the weight of the blow should be varied for different sizes of condensing points. I have found no mention of this measurement in the literature, nor have I found a satisfactory method by which to measure this force. It is hard to compute the magnitude of this type of blow accurately, since in-

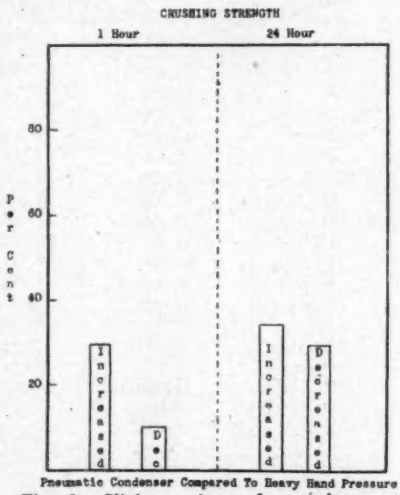

Fig. 6.—Slight tendency for condenser to increase one-hour strength. The majority of alloys have the same strength for the twenty-four hours with manipulation of either type.

ertia is such a big factor in it. By means of a simple laboratory balance I have found that approximately 2 pounds is required to trip the hammer. How much additional force is added by the blow of the hammer, I do not know. I have also estimated that approximately 4 pounds pressure was used in this investigation in packing by hand, using what I would call a heavy hand pressure. This conforms to Taylor's[16] findings that from 3 to 4 pounds pressure represents the settings of the needle valve. Only five alloys had their dimensional change reduced by more than 3 microns in going from a medium blow (notch No. 7 on the valve) to a heavy blow (notch No. 14). All others remained the same. This is in accord with Jarabak,[17] who states "an increase in condensation pressure from 3 to 8 pounds caused a dimensional change in most instances of not more than 3 microns." In considering flow, three alloys increased in flow and four decreased in using a heavier blow. Thus, for the major portion of the alloys tested, the flow remained constant with increase of hammer blow. This is somewhat contrary to the popular conception that the greater the condensation pressure, the less the flow. This however, may bear out Skinner's[18] statement that the pressure of condensation is not so great a factor in flow as has been supposed.

TABLE 5.—COMPARISON OF EXPANSION AND FLOW IN PACKING BY CONDENSER AND BY HEAVY HAND PRESSURE*

Alloy	Expansion†		Flow—Per Cent	
	No. 1‡	No. 2	No. 1	No. 2
A	— 7.0	— 5.25	3.5	2.75
B	— 3.5	— 2.25	3.0	3.9
C	+17.0	+ 0.75	8.5	3.8
D	— 1.4	— 2.0	4.6	6.0
E#	— 2.8	— 4.25	1.7	1.6
F#	— 0.5	— 5.0	5.8	7.12
G	+10.0	+ 0.75	4.4	3.5
H	— 3.9	— 5.75	3.75	5.2
I	+ 5.8	+ 5.25	3.9	5.45
K#	— 4.5	— 1.5	2.9	3.0
L	— 1.3	+ 0.25	4.38	4.0
O#	— 3.1	—2.0	3.25	2.8
P	— 5.2	— 0.5	2.7	2.1
R	— 1.8	— 3.0	3.4	2.8
S	+ 1.1	+ 8.8	4.0	4.0

*All specimens mixed with mechanical amalgamator.

‡No. 1: Packed by pneumatic condenser (heavy blow—notch No. 14). No. 2: Packed by hand with heavy pressure.

#Alloys with high mercury : alloy ratio.

†Microns per centimeter.

average and even 2½ pounds might be closer. However, many others feel that the average hand pressure is, and should be, much higher, possibly from 10 to 15 pounds. I think it is still an open question until more accurate methods of measurement are developed.

Since this force could not be measured and no definite directions are given as to the proper setting for each size condenser point, it was felt wise to compare the difference in properties in using two

Twelve of the fifteen alloys increased

in one-hour crushing strength in employing the heavy blow of the condenser, with only two alloys losing strength. When testing for twenty-four-hour crushing strength, nine alloys increased more than 1,000 pounds by the use of a heavy hammer blow and none lost in strength more than 1,000 pounds per square inch.

Summarizing, then, it appears that increasing the blow of the hammer, with the size of the condenser held constant, the physical properties of alloys packed by the pneumatic condenser with a heavy hammer blow and the same alloys packed by heavy hand pressure. Again all specimens were triturated by the mechanical amalgamator. Table 5 shows the comparison of dimensional change and flow. For specimens packed by the condenser, three alloys showed more expansion and two showed less expansion than when packed by hand. As a group,

TABLE 6.—COMPARISON OF STRENGTH IN PACKING BY CONDENSER AND BY HEAVY HAND PRESSURE*

Alloy	Crushing Strength			
	1 Hour		24 Hour	
	No. 1†	No. 2	No. 1	No. 2
A	11,000	11,400	48,100	47,500
B	17,200	16,900	51,900	48,700
C	13,700	17,400	48,500	50,900
D	12,900	13,000	47,500	48,600
E‡	12,000	9,300	48,200	45,900
F‡	12,900	8,900	44,000	42,300
G	15,700	17,900	46,100	49,900
H	15,100	11,600	50,800	49,400
I	13,000	11,900	47,000	48,100
K‡	12,300	11,800	51,800	46,500
L	12,100	11,600	49,200	45,600
O‡	10,100	9,300	47,000	44,000
P	13,000	11,000	50,400	49,800
R	12,500	10,900	50,200	51,900
S	12,600	11,600	48,300	49,400

*Alloys with high mercury ratio increase in strength in using a condenser, this indicating that it may vibrate excess mercury out. All specimens mixed with mechanical amalgamator.

†No. 1: Packed by pneumatic condenser (heavy blow—notch No. 14). No. 2: Packed by hand with heavy pressure.

‡Alloys with high mercury : alloy ratio.

(1) has little effect on the dimensional change of most alloys; (2) has little effect on flow in considering the fifteen alloys as a group and (3) increases the one hour and twenty-four hour crushing strength slightly. It would thus seem that, in considering the physical properties alone and not the effect of the blow on tooth structure, as heavy pressure as possible would be advantageous to assure increased strength.

The next step, therefore, is to compare then, the condenser and hand packed were the same as for dimensional change. Likewise, the flow is not altered, since five alloys showed an increase of more than 0.5 per cent flow and five showed a decrease in using the condenser. Again, in Figure 5, we can see graphically that, in considering the composite picture, the condenser has little effect upon the dimensional change and flow.

In Table 6, six alloys showed an increase in one-hour crushing strength

and two showed a decrease of more than 1,000 pounds. When considering twenty-four hour strength, seven showed an increase in employing the condenser, but six lost in strength. Figure 6 shows a slight tendency for the condenser to increase one-hour crushing strength, but approximately the same percentage of alloys have decreased twenty-four hour strength as did those that increased.

I have attempted to find a correlation between the particle size and this loss in strength in some of the alloys. It would seem that, during packing, the condenser might further break up particles of large grained alloys and thus, by reducing the particle size, lower the crushing strength. It is true that all six alloys which lost in twenty-four-hour crushing strength are large-grained alloys or are composed of long filings. However, only two of these lost in one-hour crushing strength and only three had the increased flow which might be anticipated by reducing the particle size. Thus, no definite correlation can be made as to particle size as related to the effect of the condenser.

Hence, it appears that, in my tests, considering the fifteen alloys as a group, there is no change in dimension, flow or twenty-four-hour crushing strength, and only a slight tendency for greater strength during the early stages of setting in employing the pneumatic condenser as against heavy hand pressure. The fact that the condenser might vibrate more mercury out than hand pressure could explain the tendency just noted for the one-hour crushing strength to go up. Mercury retards the hardening process and, consequently, the greater the amount expelled, the sooner the amalgam gains its strength. From these data, one finds that, in most cases, those alloys which had an increased percentage of flow also had a decrease in crushing strength. For example, alloy C had an increase of more than 100 per cent in flow and it also lost 4,000 pounds and 2,000 pounds for one-hour and twenty-four-hour crushing strengths, respectively. The results on this alloy alone would thus condemn mechanical packing, but the composite picture seems to show little effect by employing its use. With these data, there seems to be no general trend for pneumatic condensation to improve or lower the properties of most alloys.

It might be surmised that the pneumatic mallet operates in the following manner. The pressure of about 2 pounds exerted on the condenser point, before the hammer is tripped, apparently forces the alloy particles together, while the additional hammer blows then squeeze the excess liquid mercury and splashy amalgam to the surface. It would follow that, in alloys which have a high mercury-alloy ratio, this vibration of the hammer would expel more of the mercury than the use of simple hand pressure.

We know that the greater the amount of mercury left in, the greater the flow and the less the strength. Thus, the pneumatic condenser might aid in strengthening alloys that have a high mercury ratio. These types usually are small-grained alloys in which additional mercury is added in order to prolong the setting reaction. As seen in Tables 5 and 6, of these four alloys only one had a reduced percentage of flow. However, in the one-hour crushing strength, two alloys increased more than 1,000 pounds and the alloys K and O increased 500 and 700 pounds, respectively. For twenty-four-hour crushing strength, all four increased over 1,700 pounds per square inch. Thus, for alloys with high mercury content, the vibration action of the condenser probably aids slightly in the expulsion of residual mercury.

The final step is now to compare the properties of amalgam mixed by the amalgamator and packed by the condenser, using a heavy hammer blow, with those mixed by the mortar and pestle and packed by heavy hand pressure. Eleven

alloys had decreased expansion when mechanically manipulated and only two of these fell within the specifications. The mechanical manipulated specimens show only two alloys with decreased flow, but nine alloys developed more flow.

Seven showed increased one-hour crushing strength and only two lost. Eleven alloys increased in twenty-four-hour strength. The highest increase in twenty-four-hour strength was 19 per cent, although a few alloys lost approximately 6 per cent. On the average for all alloys, the mechanical manipulated specimens increased only 6.5 per cent in strength as compared to hand manipulation. Mechanical manipulation and packing, therefore, reduces expansion and increases flow, but increases strength slightly. Figures 7 and 8 illustrate these effects by showing the percentage of the twenty alloys that had increased or decreased physical properties under mechanical manipulation.

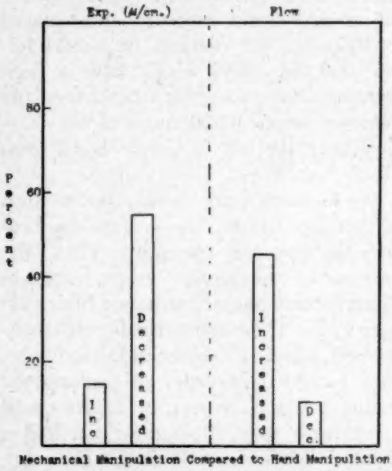

Fig. 7.—Composite picture showing tendency for mechanical manipulation to decrease expansion and increase flow.

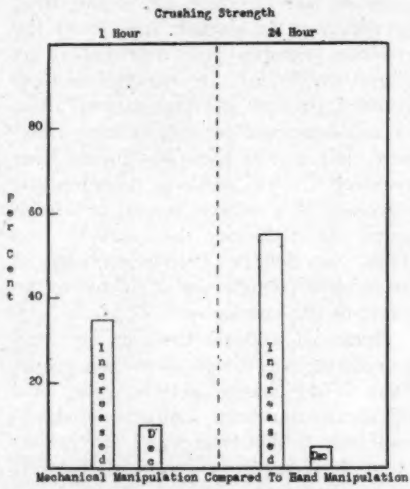

Fig. 8.—Greater percentage of alloys having increased crushing strength when mechanical manipulation is employed.

As was previously mentioned, there is no definite relationship in physical properties between particle size of the alloy and use of the pneumatic condenser. However, Figure 9 does show an apparent breakdown of the particles in large grained alloys in using the amalgamator and condenser. Shown in this picture are photomicrographs of the particle size (same magnification) of two different alloys and their carved surfaces after three varied manipulations. Carving was done one minute after packing. For the large-grained alloy at the top, in test A, in which hand mixing and packing were employed, the surface is rough. In tests B and C wherein the mechanical devices are employed, the surface is somewhat smoother, indicating that the particle size has been reduced. For the small-grained alloy at the bottom, no difference can be detected in the carved surfaces.

Now it is emphasized that these results are based on the use of only a large condenser point. Naturally, to insure proper condensation, dentists use various sizes of points during packing. It is very possible that by employing these smaller points, better properties might be obtained for the pneumatic condenser.

This investigation was intended only to compare the various methods of manipulation and thus the condenser point was held constant. Table 7 shows how great the proportional rise in pounds per square inch is in going from a large to small condenser point. For example, a change of only 0.5 mm. in the diameter of a plugger, in going from 1.5 to 1.0 mm. results in a decrease of area from 1.77 to 0.78 sq. mm. Therefore, if a constant pressure of, say, 3 pounds is applied, it will mean an increase of from 1,095 to 2,460 pounds per square inch, which is an increase of 123 per cent in terms of pounds per square inch. Thus, as stated by Green and Simon[18] in an article on gold foil, "The force required to condense gold foil of uniform weight and volume varies inversely with the square of the area of the plugger point." So, the larger the plugger point, the greater the force required to produce the same pressure in terms of pounds per square inch. More work needs to be done to correlate the force of the hammer blows with the size of the condenser point. It might even be well for the directions in the use of the condenser to contain a chart showing ideal settings for different sizes of condenser points. For the one that I employed, undoubtedly a heavy hammer blow is needed to produce adequate pressure.

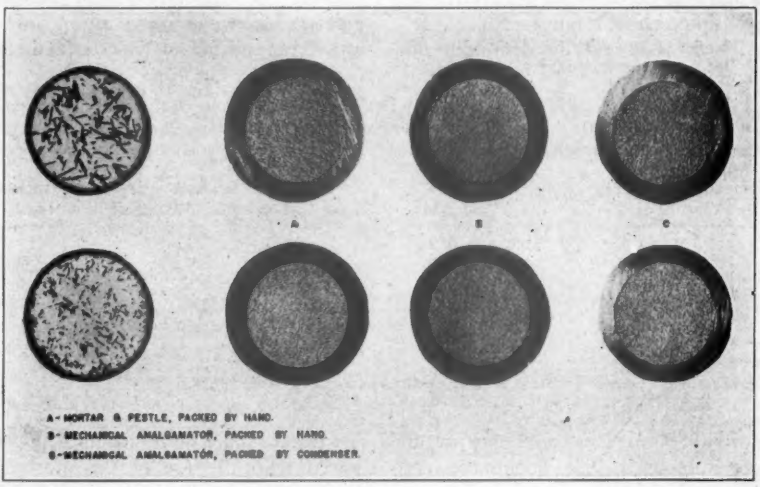

Fig. 9.—Carved surfaces of two different alloys under various methods of manipulation. The large grained alloy at the top seems to have its particle size reduced when mechanical devices are employed, but no apparent effect is noticed on the small-grained alloy below.

SUMMARY AND CONCLUSIONS

1. The purpose of this investigation was to determine, by testing a large number of alloys, whether any definite trends regarding the physical properties could be observed by using the mechanical amalgamator and pneumatic condenser.

2. The type of balance used in this report is sufficiently accurate for dental use.

3. The steel pellet should always be used in employing the mechanical amalgamator to insure more thorough amalgamation and thus greater strength and less percentage of flow.

4. It is better to rely upon sound rather than the automatic timing device. As soon as the clicking sound is no longer heard, the mix is completed.

5. In comparing the amalgamator with the mortar and pestle, mixed by the manufacturer's directions, the alloys are apparently more thoroughly triturated, since they show contraction and more flow, but somewhat higher one-hour and twenty-four-hour strengths. However, as yet, we have no definite clinical evidence as to whether this contraction and increased flow, since it is not excessive, will be evident in restorations.

6. Mechanical amalgamation, owing to the elimination of human variables, consistently gives more uniform mixes than the mortar and pestle, even when an exacting technic is employed.

7. There is as yet no definitely reliable method for measurement of the hammer blow in the pneumatic condenser, and thus it cannot be compared accurately with hand pressure. It takes approximately 2 pounds to trip this hammer. Hand pressure, as measured by balance, was 4 pounds.

8. It was found that in using a heavy hammer blow (Notch 14) as compared with a medium blow (Notch 7), the dimensional change and flow remains constant, but there is an increase in the crushing strength, both one-hour and twenty-four hour.

9. The action of the condenser (Notch 14) as compared to a heavy hand pressure seems to (1) have little effect on the dimensional change; (2) little effect on flow, and (3) a tendency to increase the one-hour crushing strength, but no effect on the twenty-four hour crushing strength.

10. There is no definite correlation as to particle size of the alloy and use of the condenser. The amalgamator and condenser do apparently reduce the particle size in large grained alloys. The condenser does seemingly more readily vibrate excess mercury out since alloys with a high mercury content increase in strength slightly by employing the condenser.

11. Mechanical amalgamation and packing by the pneumatic condenser gives reduced expansion, more flow and an average of about 6 per cent increase in twenty-four hour strength as compared with the use of the mortar and pestle when packed by heavy hand pressure.

12. Results are based only on the use of one size condenser point. The smaller the point, the greater the pressure needed to assure the same force in terms of pounds per square inch. More work needs to be done in regard to the effect of the size of different condenser points with various settings of the needle valve.

TABLE 7.—TABLE SHOWING THAT DECREASING DIAMETER OF CONDENSING POINT CAUSES INCREASE IN POUNDS PER SQUARE INCH IN EXERTING SAME AMOUNT OF PRESSURE (THREE POUNDS)*

Diameter of Condenser Point, Mm.	Area Sq. Mm.	Lbs./Sq. Inch Using Three Pound Pressure	Increase Per Cent
3.0	7.069	273	
2.5	4.909	393	44
2.0	3.142	615	56
1.5	1.767	1,095	78
1.0	0.785	2,460	123

*Percentage of increase becomes greater as condenser diameter becomes smaller.

BIBLIOGRAPHY

1. TAYLOR, N. O.: Mechanical Amalgamation. J.A.D.A., 16:583-589, April 1929.

2. CANNON, C. C.: Amalgam: a Definite Mode of Manipulation. J.A.D.A., 23:629-641, April 1936.

3. TINGLEY, H. E.: Recent Finds in Use of Amalgam. *New York J. Dent.*, 8:56-62, February 1938.

4. SWEENEY, J. T.: Uncontrolled Variables in Amalgam, with Significant Improvements in Making of Restorations. J.A.D.A., 27:190-197, February 1940.

5. *Idem:* Amalgam Manipulation: Manual Vs. Mechanical Aids. Part II. Comparison of Clinical Applications, J.A.D.A., 27:1940-1949, December 1940.

6. ROMNES, A. F.: Clinical Aspects of Amalgam Restorations. J.A.D.A., 28:54-63, January 1941.

7. HOLLENBACK, G. M.: Use of Amalgam in Restorative Dentistry. *J. Colorado D. A.*, 21: 35-40, December 1942.

8. KILPATRICK, H. C.: Elimination of Variables in Amalgam Manipulation. *D. Digest*, 49:76-78, February 1943.

9. MCCAULEY, C. M.: Changes Needed to Make Better Amalgam Fillings. *J. S. California D. A.*, 10:9-11, August 1943.

10. PHILLIPS, R. W., *et. al.:* Clinical Observations on Amalgams with Known Physical Properties. *J. D. Res.*, 22:167-172, June 1943.

11. WARD, M. L., and SCOTT, E. A.: Effects of Variation in Manipulation on Dimensional Change, Crushing Strength and Flow of Amalgam. J.A.D.A., 19:1683-1705, October 1932.

12. SWEENEY, J. T.: Amalgam Manipulation: Manual Vs. Mechanical Aids. J.A.D.A., 27:1940-1949, December 1940.

13. SKINNER, E. W.: Research on Flow of Dental Amalgams. J.A.D.A., 25:1651-1660, October 1938.

14. SHEPHERD, I. M.: Condensation of Silver Amalgam with Electric Mallet. *D. Items of Int.*, 58:856, October 1936.

15. TINGLEY, H. E.: Clinical Use of Amalgam. *D. Items Int.*, 62:608-624, July 1940.

16. TAYLOR, N. O.: Amalgam Technic, Dependable and Dangerous Practices. J.A.D.A., 17:1880-1889, October 1930.

17. JARABAK, J. R.: Effect of Particle Size on Dimensional Change in Dental Amalgams. J.A.D.A., 29:593-605, April 1942.

18. GREEN, R. O., and SIMON, W. J.: Proximal Gold Foil Filling. J.A.D.A., 29:559-570, April 1942.

GINGIVITIS AND VITAMIN C

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INTRODUCTION

DURING the past few years, some reports in the literature[1, 2, 3] indicate a conflict of opinion regarding the use of ascorbic acid in the treatment of gingivitis. From a clinical point of view, it must be said that the only known uses of vitamin C are the prevention of scurvy and the treatment of scurvy.[4, 5] The possible exception to this, the action of the vitamin on the intermediary metabolism of aromatic amino, acids in premature infants,[6] is interesting, but requires further investigation. The use of the vitamin in gingivitis is based on the assumption that this process is either due to a scorbutic process or that it is improved by the administration of extra ascorbic acid. It appears, therefore, that much of the confusion is based on evaluation of the local lesion in relation to a vitamin deficiency. It is therefore the purpose of this communication to present certain data and considerations which might clarify the problem.

At first glance, the problem resolved itself into placing in categories the various bases for the existence of gingivitis, and secondly into accepting certain defi-

The material in this article should be construed only as the personal opinions of the writers and not as representing the opinion of the Navy Department officially.

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nitions for the various pathologic processes. Within certain limitations, gingivitis can be classed broadly as follows:

1. Gingivitis based on a great variety of mechanical, pathologic and constitutional conditions not related to vitamin C economy.

2. Gingivitis based on an active scorbutic process wherein there is a marked tissue deficit of the vitamin and a resulting change in collagen formation.

3. Gingivitis as a disease resulting from a one-time scorbutic process, but where the subject is at present

(a) Consuming a maintenance intake of vitamin C.

(b) Consuming less than the maintenance requirement of vitamin C.

(c) Consuming more vitamin C than is necessary for maintenance economy, but having a deep seated gingival lesion which transcends the original defect.

These, then, are the essential possibilities. It is obvious that any lesions described in Section 3 may very well belong in Section 1 or be concurrent with any of the processes mentioned in the other sections. The advent of pocket formation and the presence of exudate superimposes a new disease, and should the subject be scorbutic, this process must require specific dental therapy as well as the systemic care given to the patient.

In order to clarify the following discussion, it may be well to define the terms used.

Gingivitis: Any inflammatory process involving the gums.

Periodontal disease: Pyorrhea alveolaris, *Schmutz* pyorrhea, diffuse atrophy, paradentitis, periodontoclasia, Riggs' disease: Disease processes involving the supporting structures of the teeth.

Scurvy: A clinical entity dependent on a prolonged depletion of ascorbic acid in animal tissues, with a resultant morphologic change in the intercellular substance of certain mesenchymal derivatives. As a result, hemorrhages occur and the gums, lacking intercellular substance, become boggy and swollen. According to Hess,[7] absolute reliance must not be placed on gum changes for an early diagnosis, as usually they do not appear until late in the disease. The early signs of perifollicular hemorrhages and petechial spots are much more characteristic. In 1940, when Crandon[4] induced scurvy in himself, there were no gum changes whatsoever, but all other signs and symptoms of scurvy were present and tissue biopsies revealed little or no collagen. However, it is well to bear in mind that stress modifies and at times determines the site of gross lesions. Thus, the gums are often subjected to trauma by chewing, etc., and separation may occur on a mechanical basis, promoting periodontal disease.

Maintenance Intake of Ascorbic Acid.—The amount of ascorbic acid, either synthetic or derived from food, needed to prevent scurvy and which maintains a sufficient and a somewhat constant content of the white-cell tissue layer of the blood or other tissues is the daily minimal requirement. This may be related to time and function, so that sporadic increased intakes of the vitamin may compensate for periods of inadequate intake.[5, 8] Such an intake averages about 25 mg. of ascorbic acid a day for a twenty-one month period in the normal adult subject.[5]

At other times, subjects consuming large doses of ascorbic acid become saturated, and protection against scurvy for a period of from four to six months exists even though the subject consumes none or little of the vitamin.[4] This is evident in natives consuming fruits high in ascorbic acid in season, and relatively little at other times.[9]

Therapeutic or Curative Intake of Ascorbic Acid.—An undramatic and slow response occurs when the small maintenance dose of ascorbic acid or slightly more is administered to the scorbutic subject. Relatively small doses may take weeks to have the necessary therapeutic

effect. Thus, large doses of the vitamin, of 150 mg.-1,000 mg., should be given daily. After treatment, the patient can be placed on a maintenance dose. Some investigators[17] have confused the maintenance minimal intakes with optimum therapeutic doses of the vitamin.

Criteria for the Evaluation of Scurvy.—The diagnosis of this disease must be based on the clinical picture, which has been amply discussed elsewhere.[4, 5] The use of the saturation tests and urinary excretion tests, as well as plasma ascorbic acid values, do not contribute to the diagnosis of scurvy.[5, 11, 12] If, on the other hand, the blood tissues, i.e. the white-cell platelet layer, values are low, or zero, the diagnosis of scurvy will receive adequate laboratory confirmation.[4, 5, 11]

CERTAIN FINDINGS RELATED TO SCURVY AND GINGIVITIS* IN SIX ADULT SUBJECTS ON A SCORBUTIC REGIME†

Subject	Age	Sex	Ascorbic Acid							
			Initial Values		2 Months		4 Months		5-6 Months	
			Plasma‡	Plasma & White Cells#	Plasma	Plasma & White Cells	Plasma¶	¶Plasma & White Cells	Plasma¶	Plasma & White Cells
J. K.	26	♂	1.1	30.0	0.2	20.0		11.0		Trace
M. W.	42	♂	0.96	32.0	None	18.0		6.0		None
T. L.	38	♂	1.0	32.0	None	18.0		8.0		Trace
C. L.	64	♂	1.2	28.0	0.1	22.0		10.0		None
A. M.	36	♀	0.96	30.0	None	20.0		10.0		4
C. A.	26	♀	0.96	26.0	None	16.0		7.0		None

*Initially, the gums were negative (no scurvy). The tests at two months continued negative. At four months, there was still no scurvy, and the gum condition was negative, except for soreness in subject C. L. and questionable findings in M. W. At five-six months, the gums were negative except for swelling, tenderness and bleeding in subject M. W. The scorbutic findings were positive at this period except in subject A. M.

†The teeth were carefully brushed, the subject using a fine castile soap morning and night.

‡Milligrams per hundred cubic centimeters.

#Milligrams per hundred grams.

¶None.

THE PROBLEM: THE RESULTS

The problem resolves itself into two phases: (1) to ascertain whether gingival disease parallels a depletion of ascorbic acid, and (2) to determine whether ascorbic acid economy is disturbed in gingivitis, thus requiring an increased intake of the vitamin for therapeutic purposes. In regard to the first problem, it seems unlikely that the cases of gingivitis ordinarily seen are in any way related to scurvy. Ungley[13] and King[14] clearly showed that administration of vitamins in large doses failed to exert any beneficial effect on gingivitis. Ralli[15] pointed out some time ago that gingivitis may, in general, have a multiplicity of causes other than scurvy, and Crandon[4] failed to develop gingival lesions during his experience as a scorbutic. On the other hand, numerous investigators[18, 19] have combined vitamin C therapy with dental hygiene and dental procedures and have reasoned that such a form of treatment gave satisfactory results. Since gingivitis is a disease with various manifestations and etiology, the conclusions drawn were unwarranted. In some reports, the assumption that subclinical scurvy existed was based on the saturation test with vitamin

C. This test is dependent on urinary elimination of a large amount of a test dose of ascorbic acid. It has been supposed by some that if no ascorbic acid is eliminated after such a dose, the subject is deficient in this vitamin. This has been shown[5] not necessarily to indicate scurvy. Others[16] assumed that low plasma vitamin C values were indicative of scurvy. The plasma vitamin C is always zero in scurvy, but it can also be so in non-scorbutic states, since it is the presence of the vitamin in the blood tissues (white-cell platelet layer) that is significant.[4, 5, 10, 11]

Six subjects, volunteers, after saturation with vitamin C, were placed on an ascorbic acid free régime (Table 1).

The diet consisted of eggs, cheese, cooked cereals, a variety of beans, bran flakes and debittered yeast and contained all vitamins with the exception of ascorbic acid. A variety of dishes were prepared from the above and numerous seasoning adjuvants were used. On the whole, the diet was well tolerated.

The diagnosis of scurvy during the fifth and sixth months was based on the appearance of perifollicular hemorrhage and petechiae. Some had moderate and diffuse cutaneous hemorrhages over the thigh. None of the subjects objected to these findings. Lassitude and fatigue took place during the fourth month. After the advent of scurvy, treatment was immediately instituted with 1 gm. of ascorbic acid a day and a regular diet.

It would be difficult to say what gum changes might have occurred if the patients had been maintained on this régime. It is highly probable that gingivitis would have manifested itself. On the other hand, the data indicate that a shortage in the vitamin (in this case, a lack of it) does not readily lead to gingivitis. With the exception of one subject none had any noticeable changes in the gum tissues. It is well to point out that the diet was essentially a bland one, and that if more active chewing had taken place, the gums might have been more easily injured. The fact that pressing and scraping the papillae in an occasional test did not bring about a marginal gingivitis supports the view that gingivitis is a late manifestation of scurvy and that it is not easily induced by a scorbutic régime. At least, the evidence suggests this concept.

Concomitantly with this study, a series of patients were chosen in whom the actual pyorrhea was minimal, but gingivitis fairly pronounced. Out of a group of about sixty subjects with pyorrhea and gingivitis, only eighteen could be placed in this category. The others had deep seated pocket formation and exudate. The plasma ascorbic acid levels in these eighteen subjects varied from 0.2 to 0.6 mg. per hundred cubic centimeters. The white-cell platelet values varied from 16 to 24 mg. per hundred grams. These determinations were carried out at intervals of four days for three separate tests. On the whole, the values remained approximately within the range of the initial ones, and since the values were nowhere in the limits of scorbutic values, a positive state of ascorbic acid economy existed. The use of 1 gm. of ascorbic acid and 3 glasses of fresh orange juice daily for three weeks failed to alter the condition in any way. No dental hygiene was used. A group of twenty cases with a much more advanced pyorrhea process and with a somewhat similar ascorbic acid economy of the blood tissues, but who received no ascorbic acid whatsoever (placed in the diet of the six subjects studied), showed the usual variable improvement with local therapy. In about one-third, there was definite improvement; in one-third, no change, and in one-third, the results were equivocal. All of these subjects were hospitalized. It was, furthermore, the impression of the dental consultants that a bland diet contributed to the treatment of pyorrhea and gingivitis, the gums being subjected to less trauma.

There is no way to exclude the possibility that gingivitis in some cases may have been due to some early scorbutic process and, with chronic infection and pyorrhea, the dental condition persists regardless of subsequent ascorbic acid intake. It is our impression that such an etiology is unlikely.

CONCLUSION

The assumption that gingivitis, with or without pyorrhea, is on a scorbutic basis is unwarranted unless there is antecedent or present clinical evidence of scurvy. The only laboratory confirmation of the diagnosis being a depleted white-cell platelet ascorbic acid content, no other test with the exception of the index gained by whole blood values is reliable.

Gingivitis and its periodontal manifestations is, in most instances, a local lesion, and its connection with systemic processes requires considerable additional study.

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BIBLIOGRAPHY

1. ROFF, F. S., and GLAZEBROOK, A. J.: Therapeutic Application of Vitamin C in Peridental Disease. *J. Roy. Nav. M. Serv.*, 25:340, October 1939.

2. STUHL, F.: Vitamin C Subnutrition in Gingivostomatitis. *Lancet*, 1:642, May 22, 1943.

3. HANKE, M. T.: Relation of Diet to General Health and Particularly to Inflammation of Oral Tissues and Dental Caries. J.A.D.A., 27:957, June 1930.

4. CRANDON, J. H.; LUND, C. C., and DILL, D. B.: Experimental Human Scurvy. *New England J. Med.*, 223:353-369, September 5, 1940.

5. PIJOAN, M., and LOZNER, E. L.: Physiological Significance of Vitamin C in Man. *New England J. Med.*, 231:14, 1944.

6. LEVINE, S. Z.; GORDON, H. H., and MARPLES, E.: Defect in Metabolism of Tyrosine and Phenylalanine in Premature Infants. *J. Clin. Investigation*, 20:209, March 1941.

7. HESS, A. F.: Scurvy, Past and Present. Philadelphia: J. B. Lippincott Co., 1920.

8. PIJOAN, M., and ROSKELLEY, R. W.: Nutrition and Certain Related Factors of Spanish Americans in Western Colorado. Rocky Mountain Council on Inter-American Affairs, Denver, 1943.

9. GOUBAUD, A.: Personal communication to the authors.

10. BUTLER, A. M.: Vitamin C Deficiency. *M. Clin. North America*, 27:441, March 1943.

11. BUTLER, A. M., and CUSHMAN, M.: Distribution of Ascorbic Acid in Blood and Its Significance. *J. Clin. Investigation*, 19:459-467, May 1940.

12. RIESTSCHEL, H., and MENSCHING, J.: Experimenteller C-Vitamin-hunger am Menschan, ein Beitrag zur Frage des C-Vitamin bedarfs. *Klin. Wchnschr.*, 18:273, February 25, 1939.

13. UNGLEY, C. C., and HORTON, J. S. F.: Bleeding Gums in Naval Personnel, Vitamin C and Nicotinic Acid Intake. *Lancet*, 1:397-399, March 29, 1943.

14. KING, J. D.: Nutritional and Other Factors in "Trench Mouth" with Special Reference to Nicotinic Acid Component of Vitamin B_2 Complex. *Brit. D. J.*, 74:113-122, March 5; 141-147, March 19; 169-176, April 2, 1943.

15. RALLI, E., and SHERRY, S.: Adult Scurvy and Metabolism of Vitamin C. *Medicine*, 20:251, September 1941.

16. ABT, A. F., and FARMER, C. J.: Vitamin C: Pharmatology and Therapeutics, in the Vitamins, a Symposium. Chicago: American Medical Association, 1939, pp. 411-442.

17. KYHOS, E. D., *et al.*: Minimum Ascorbic Acid Need of Adults. *J. Nutrition*, 27:271, 1944.

18. BURRILL, D. Y.: Relationship of Blood Plasma Vitamin C Level to Gingival and Periodontal Disease. *J. D. Res.*, 21:353, August 1942.

19. BUCHANAN, J. W.: Hypovitaminosis C and Infective Gingivitis. *J. Roy. Nav. M. Serv.*, 29:249, October 1943.

MAXILLOFACIAL PROSTHESIS*

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MAXILLOFACIAL prosthesis can be defined as the science of restoration of defects of the oral cavity, face and head by mechanical means. This typical definition as usual needs some explaining. It simply means that, in case a person loses an ear, a nose, an eye plus surrounding flesh or a portion of the jaws and contiguous structures, it is impossible to replace this loss by means of plastic surgery. It is then necessary to use artificial substances to replace the lost structures so that these people will be enabled to proceed with their daily lives in a normal manner. It has fallen to the lot of the dentist to take over the specialty because he is specially trained in the handling of many materials. He has studied the physiology and anatomy of human tissues. He also is skilled in the art of taking impressions and the making of positive and negative molds.

The name of this branch of prosthesis has varied greatly, and now there is no agreement as to the proper term to be used. "Surgical prosthesis," the first widely used name, is somewhat misleading because it implies that surgical measures are to be preferred in restorations. This is not true. "Special prosthesis" has been suggested, but this term is too comprehensive because it would include restoration of missing parts of the body such as legs and arms. "Maxillofacial prosthesis" is not quite comprehensive enough because this term does not include the restoration of the ear. Therefore, the name of the specialty should be maxillofacial aural prosthesis. However, to conform to the practice of using a simple descriptive phonetic title, I shall use the term of maxillofacial prosthesis.

One of the greatest disappointments that can befall parents is to learn that their baby has a cleft palate. This is usually discovered when they find that the infant cannot be fed normally, the milk pouring from the nose when an attempt is made to swallow. This stigma is a calamity the child may carry the rest of its life.

Every one is familiar with the cleft palate voice. Speech habits are formed in an attempt to compensate for the lack of a pharyngeal-laryngeal seal. These habits are extremely hard to overcome even though a perfect operation is performed in remedying the cleft.

Cleft palate occurs in all walks of life, but it is well known that it occurs more frequently among the poor. This indicates that it may, at least in part, be a dietary problem.

When a cleft palate is discovered, the first thing that comes to mind is an immediate operation. Operative procedures can be used, but will, in rare cases, be successful. It is the opinion of several men interested in the work that, in 85 per cent of cases, it would be much better if the child were not operated on at all. This striking statement contradicts the general belief. The reason that operative procedures should not be used is that a foreshortening and immobilization of the soft palate usually results. This condition makes it impossible to attain a pharyngeal-laryngeal seal,

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and an escape of air results in a cleft-palate voice. At the same time, this greatly reduces the chance for construction of a satisfactory obturator. Surgical measures should be carried out with a thorough understanding of the exact requirements made of soft tissue when an obturator is used. It may be said that in all cases of cleft palate, except the minor simple bifurcation of the uvula or a bifurcation of a small portion of the soft palate, a mechanical appliance is required regardless of the surgical procedures.

I spoke of the unusual speech habits in cleft palate cases. Construction of an obturator that will assure a satisfactory voice is possible, but satisfactory results are possible only when the obturator is correctly constructed and the patient diligently applies himself to developing correct speech. At Columbia University, in one of the largest cleft-palate clinics in the world, it is the rule to exact a promise of all patients to attend a school of abnormal speech.

The appliance can be constructed with a movable velum to simulate the soft palate, or it can be fixed. The function that the appliance is to perform is to fill in the defect and seal the air space between the pharynx and the larynx on swallowing and speaking. When the superior sphincter muscles constrict, a pad is formed on the posterior surface of the larynx which, on contraction, effects an adequate posterior seal with the velum. This is called Passavant's pad. The lateral constrictors then complete the seal. One can easily visualize the result of an operation that limits the action of the musculature.

The most difficult part of cleft palate work is to teach the patients to speak properly. It is difficult, for they have never had a normal voice at any time in their lives and therefore do not have a comprehensive idea of how the different voice sounds are made. They in reality have to learn to speak all over again. One of the leading men in the field of obturator and velum construction is a dentist with a cleft palate. He had several unsuccessful operations, and today wears an obturator with a fixed velum of his own design. His voice is perfectly normal, and unless you saw the obturator in place, you would never imagine that he had had a speech defect.

In the past, it was common practice for a surgeon while operating on a cleft palate and harelip in an infant to remove entirely the premaxillae. The premaxillae in Class 4 cleft palate are movable and free from attachment except for the columella of the nose. This fragment contains four teeth and its loss is a tragedy, for the patient will lack development of the middle one-third of the face and shortening of the upper lip will be the result. This is a difficult condition to correct in an adult by prosthetic means.

There are also conditions which simulate cleft palate, defects of the maxilla or soft palate caused by surgical operations or traumatic injuries, or perforation caused by infectious processes. The type that is more commonly seen in the U. S. Marine Hospitals is that caused by surgical intervention in carcinoma. We have had a number of these cases.

In one, a boy, aged 15, whose entire soft palate had been removed incidentally to removal of an angiofibroma (juvenile) tumor of the left nasal pharynx, an obturator, constructed for him, was quite successful in that eating was facilitated and he could drink water from a drinking fountain. There was not much improvement in his speech, for he did not use it sufficiently long to become proficient in its use, because of a recurrence of the growth.

The second case was that of a Negro, aged 39, who had an intra-oral minor salivary gland adenocarcinoma of the soft palate, which was removed surgically in 1941. So far, there has been no recurrence. An attempt was made to construct an obturator a year ago. As this obturator was not adequate, I constructed a new one of the fixed

type, of methyl methacrylate attached to a gold skeleton, in turn attached to the teeth present. The case was very successful. The patient, with a little practice, could talk normally, and he stated that he just could not get along without the device in eating. A yearly checkup demonstrated a perfect restoration of the voice.

The third case was that of a white man, aged 70, who had a squamous carcinoma of the upper left alveolar ridge. The left maxilla had been removed surgically and, as a result, there was a sinus communicating between the nasal and oral cavity. The soft palate was intact. The man was edentulous. The difficult part of this replacement was the fact that there was only half an upper ridge on which to place the denture and the communicating sinus to the nasal cavity reduced the so-called suction or adhesion of the upper denture to nil. A lower denture and upper denture with an obturator were constructed. The patient, returning for a checkup after six months, stated that he wore the dentures all of the time. He could eat with them, and he said that if he took the dentures out, no one could understand him.

Utilization of mechanical appliances in surgical clefts are more satisfactory than in congenital cleft palate for the reason that the patient at one time in his life had a normal voice and thus knows how to make the various sounds. The patient can also very quickly learn to stop the passage of food and water into the nasal cavity on swallowing. The ultimate use of mechanical appliances can be greatly improved if the surgeon and prosthodontist work together and understand each other's problems so that an operation can be instituted that will fulfil the requirements of them both.

Obturators to seal simple perforations of the hard palate can be easily constructed, and they are very satisfactory.

Perhaps the most spectacular maxillofacial prosthetic devices are the ones used to replace missing noses, ears and eyes with portions of the cheek tissue missing. That is because of the fact that they are most obvious and because esthetic values are so important in these devices. The art of sculpturing is very important. A nose, an ear or a portion of cheek has to be so shaped and lined that it will blend with the remaining features of the patient. Skin texture has to be duplicated. The art of application of color has to be mastered. It is of little value to place a perfectly shaped prosthesis if the color is off. Skin color is difficult to match. As a last resort, the new blemish creams and powders can be used by a painstaking and fastidious patient. All of us are acquainted with the commercial skin creams that are used to hide birthmarks. I have seen a birthmark the size of a hand concealed by the use of these creams. One could not distinguish the birthmark at 2 feet. This, as can be imagined, would be of value in this work.

There are a number of conditions which may lead to destruction of all or a portion of a nose or an ear. The causes of these defects may be classified as follows:

A. Trauma.
   1. Automobile or railroad accidents.
   2. Gunshot wounds.
   3. Miscellaneous trauma.
B. Pathologic change.
   1. Malignant lesion.
   2. Syphilis.
   3. Lupus vulgaris.
C. Congenital deformity.

It is a rather simple procedure to perform a total or partial rhinoplasty in case of a defect of a nose, and it will be repaired satisfactorily. Defects of the ear, however, do not lend themselves well to repair by plastic surgery.

Plastic surgery is always given first consideration in the correction of these defects because a skilful plastic surgeon can transfer tissue from other parts of the body and can build a very satisfactory nose. There are, however, several conditions which favor the replacement of a nose or a portion of a nose by prosthetic methods. Some of these con-

ditions are: (1) the advanced age of the patient; (2) a malignancy wherein it is inadvisable to perform a rhinoplasty until one is certain that there is no recurrence (examination of the tissue is facilitated by easy removal of a prosthetic nose); (3) inability of the patient to pay for rhinoplasty; (4) the inadvisability of a plastic operation because of the location or the size of the defect.

In the past, many materials have been used to construct prosthetic noses, ears, etc. Gelatin, vulcanite, metals, celluloid and combinations of these substances have been used in the past. None of these materials met the requirements for a satisfactory external prosthesis, which must be (1) easily constructed; (2) easily colored to match the surrounding flesh; (3) easily attached and difficult to dislodge; (4) of a fleshlike consistency or feel, and (5) durable and easily cleaned.

There is no material so far that meets all of these requirements. A. H. Bulbulian, of the Mayo Clinic, and C. D. Clark, of the University of Maryland, developed prevulcanized latex rubber that could be used to make prosthetic ears, noses, etc. This is the most satisfactory material so far, meeting the foregoing requirements except for the fact that it is not too durable or permanent. It is, however, an easy matter to make replacements from the original mold.

Recently, I have been experimenting with the use of methyl methacrylate resin, a plastic for the construction of these external prosthetic devices. I have tried to develop the use of methyl methacrylate in this field because it is permanent. Latex pieces, on the other hand, have to be replaced frequently. However, C. D. Clark, of the University of Maryland, states that his latex prosthetic pieces are permanent. The main problem in the use of plastics is to achieve a fleshlike appearance and color.

Many other prosthetic devices can be made with latex rubber and methyl methacrylate. Large defects such as contusions and surgical tissue defects can be filled in. Fingers, complete with the nail, can be constructed, and breasts have been made of latex after total mastectomy.

Eyes have been replaced complete with eyelashes. H. J. Carney, of Boston, went one step farther. In replacing an eye, he made the artificial eye movable just as is a doll's eye on movement of the head. The eye could move up and down and laterally. This was an experiment and was not considered of enough value for the amount of time and work put into the construction of it.

In many cases in which large amounts of tissue have been removed from either the face or within the oral cavity, large infected granulating areas result that will not epithelize. This is especially true in malignant conditions in which radium and x-rays were previously used. These cases can be controlled by the use of skin grafts held in apposition with the prepared surface by means of a previously prepared stent.

Other stents can be used to predetermine the shape of prepared tissue. An example of this is the use of a latex eyepiece shaped like an artificial eye, around which the eye sockets are reformed by grafts. In gunshot wounds of the face, it is useful to construct stents that hold graft tissue in the desired shape to counteract the pull of scar tissue. In the construction of the anterior portion of the mandible in gunshot wounds, a stent can be used to hold the chin in proper shape until there is sufficient tissue transplanted in which a bone graft can be placed. The same holds true in rhinoplasty. A tube from the forehead can be transplanted and held in shape by a stent until an implant can be placed. The construction of a stent to reconstruct the chin is the work of a prosthetist trained in the basic principles of orthodontia. Orthodontic bands are constructed and arch bars are

soldered to them in the proper place. The stent is held to the arch bar by mechanical means. This type of stent can be made of dental modeling compound, or it can be constructed of a more durable inert material. A stent can also be used to skin graft the lower labial reflection. The graft is sewed over the stent with the epithelial side toward the stent and it is put in place. The graft will usually "take" in a week.

Today, it is the accepted and advisable treatment of all malignant and some non-malignant tumors involving the lower jaw to resect the portions of the mandible involved. This is usually complete with disarticulation and removal of the ramus and body on the affected side. The portion remaining is usually one-half of the mandible, either the right or left side. The fragment remaining is pulled downward and inward and rotated by the muscles attached and also by scar formation. It is possible to construct an appliance that will restore this portion of the mandible to its normal position and function. At the same time, scar tissue can be counteracted by use of a stent on the same appliance. These appliances can either be hinged to the upper jaw on the affected side or can rely on soft tissue control as the case warrants. It need not be said that the greater the number of natural teeth remaining in the arch, the more successful the appliance. If all the teeth are absent, it is necessary to resort to the use of coil springs such as were used to hold George Washington's teeth in place. An appliance of this type can be worn the rest of the patient's life or until the operator is certain that the malignancy is controlled and that there has been no recurrence. A bone graft then can be prepared, using the crest of the ilium as the source of the graft.

In plastic surgery, esthetic values can often be enhanced by the use of artificial implants; that is, by placing artificial substances within the tissue to hold it in proper shape. Various materials can be used in this work. Some of them are ivory, such metals as vitallium or silver, bone, cartilage or paraffin. The prosthodontist can aid in the construction of implants because of his knowledge of mechanics, metallurgy and materials.

Some time ago at the U. S. Marine Hospital, Baltimore, Md., clear methyl methacrylate plastic resin was considered for use in an artificial implant since it is easily conformed to a predetermined form. The problem of toleration by tissue had not been determined. Slivers were placed in tube pedicle grafts and were allowed to remain about four months. These were removed and microscopic sections demonstrated no foreign-body reaction. As a result of these experiments, a plastic implant was placed in the bridge of a nose in a rhinoplasty instead of using cartilage from a rib. This procedure precluded an operation for cartilage removal. The implant has been in place for eight months with no evidence of foreign body reaction.

There are a number of appliances that can be constructed by the prosthodontist to aid the general surgeon. Ingenuity and close cooperation between them are demanded, but together they can work out practical aids in solving practical problems. I will cite one case.

A white man, aged about 45, fell on a sharp upright stick, which penetrated the perineum and punctured the bladder, ileum, jejunum and colon. A reparative operation was performed. In four days, a fistula developed. It was the belief that it was a jejunal fistula because of the intense action of the discharged contents on the surrounding epithelium. Within thirty-six hours, an area of epithelium 5 inches in diameter was eroded around the opening of the fistula. The fistula itself was enlarged. Because of the patient's poor condition, resulting from the previous operation, it was necessary to forego reparative surgery. Palliative measures were used. Yeast packs were

employed with little effect. At this time, the surgeon requested a block or peg of some kind for the fistula. I constructed a peg to fit the fistula accurately, and it was attached to a plate adapted to the contour of the abdominal wall and covering the eroded epithelium. The appliance was held in position by means of bandages. The fistula closed within twenty-four hours and the epithelium regenerated within thirty-six hours. The material used for the peg and plate was hard wax.

This is a method of treatment for recurrent static ulcers about the ankle. Chronic venous insufficiency of the leg may develop as a complication of primary varicose veins. Acute manifestations of chronic venous insufficiency are orthostatic edema, chronic indurated cellulitis, eczema and ulceration. These complications always occur in the lower region of the leg, particularly in the region of the ankle.

The first clinical manifestation of chronic venous insufficiency is orthostatic edema, and the other manifestations are rare if the edema can be prevented. It has long been known that the use of adequate supporting bandages will prevent edema and its sequelae. Various types of support have been employed, such as Unna's paste boots, adhesive bandages, cloth mesh bandage, elastic stockings and solid rubber bandages. In the experience of the Mayo Clinic, the solid rubber bandage was the most satisfactory, but it did not conform to all the irregularities of the leg and ankle. A. H. Bulbulian, of the Mayo Clinic, devised and constructed a latex pad which exactly fits each individual patient and exerts an even degree of pressure on the skin around the maleolus. It can be worn for long periods of time. The skin will remain in good conditions without ulceration.

Another phase of medicine in which a prosthodontist can be of material aid is the construction of masks and models. Surgical, prosthetic and orthodontic procedures on component parts of the oral cavity, face and head have a marked influence on the appearance of a person. When such a radical change is contemplated, it is of value to make a permanent record of the case in a face mask. One can look back to this mask to see just what has been accomplished.

Masks and models are also valuable for education and demonstration. All of us have seen models in medical museums. This work can be done if one is willing to show an interest and put forth a little effort. Surgical specimens can be duplicated, for example, and they would be valuable for teaching purposes. Psychologists say that 75 per cent of learning is by seeing. That stresses the importance of this type of education.

Treatment of cancer about the oral cavity usually requires some form of interstitial radiation, of sufficient force to inhibit growth of the neoplasm. This dosage, however, is harmful to the surrounding normal tissues. Because of the construction of the oral cavity and adjacent tissues, it is very difficult to confine the radiation to the specific point desired. Protective appliances can be constructed that will aid in localizing the radiation to the tissues as desired. A filter such as lead is used and embedded in a shield and the tissues to be protected are held as far away from the point of radiation as possible to take advantage of the inverse law of radiation dosage as related to the distance from the point of radiation. For example, if the intensity at 1 cm. from the surface of a radon seed is 100 and the distance is increased to 1.5 cm., the intensity will be 40. If increased to 2 cm., the intensity will be 25. By taking advantage of the filtering effect of the lead and the reduction in intensity of the distance, normal tissue surrounding a neoplasm can be given some protection in the use of interstitial radiation.

Lead shields or masks can be constructed to fit any tissue of the body.

Then a specific opening can be cut in the lead to expose only the neoplastic tissue to radiation. Surrounding normal tissue will be protected by the lead covering. If the shield is coated with a thin coating of wax, the secondary rays which are emitted from the mask are controlled. The advantage that lead shields afford in radiation therapy is the protection of the normal tissue surrounding the neoplastic tissue.

I should like here to stress one point: If radiation is contemplated in or around the oral cavity, the operator should determine whether any teeth are to be extracted in the line of radiation, and, if so, be sure to extract them before radiation therapy is instituted. Extraction of teeth from irradiated bone will in a great percentage of cases result in radiation necrosis or osteomyelitis of the supporting bone. W. L. Watson, of Memorial Hospital, New York, N. Y., says that a tooth which has been in the line of radiation should not be extracted until it becomes absolutely necessary; i.e., a tooth that is very loose or very painful.

In certain cases, it is deemed advisable not to plant radon seeds in the tissue, but to apply them to the surface of the neoplasm by embedding them in the surface of a stent that accurately fits the surface. An example is the application of radon seeds to a lesion on the cervix. The stent can be constructed of solid latex rubber, dental compound or plastics.

Many types of splints can be constructed for the reduction and immobilization of fractures of the jaws. These splints are designed and constructed for each individual case. Ingenuity can be used in designing them to conform with the needs of each case.

Deformities of the mandible can be treated by surgical means with the aid of the prosthodontist. Prognathism and retrusion of the mandible, except in minor cases, should not be treated by orthodontic means, but by surgery. V. H. Kazanjian, of Boston, believes that if there is as much as one cusp difference from normal in either the prognathic or the retrusive position, the case should be treated surgically. The results are immediate, and there are few complications. Splints or orthodontic appliances are constructed before the operation. The rami are then cut and the teeth moved backward or forward into occlusion as the case demands and fixed there by means of a previously constructed splint or orthodontic band. Hospitalization time averages twelve days, and the jaws are wired on the average of sixty days. Very few complications are experienced. Open-bite cases can be treated in the same manner, but it is necessary to sever the bone in the region of the body of the mandible.

I have outlined briefly and have given examples of treatment by the use of maxillofacial prosthesis. Few men are interested in this type of work because the demand is somewhat limited and the remuneration is personal satisfaction rather than monetary gain, for people thus affected seem to belong to the lower income groups. The few men who have been diligently working in this field have contributed greatly to its advancement. It is the general opinion that the future holds great possibilities for the development of maxillofacial prosthesis.

BIBLIOGRAPHY

1. CASE, C. S.: Practical Treatise on Technics and Principles of Dental Orthopedia and Prosthetic Correction of Cleft Palate. Ed. 2. Chicago: C. S. Case Co., 1922.

2. CARNEY, H. J.: Cleft Palate and Facial Restoration. *Apollonian*, 8:69, April 1933.

3. KAZANJIAN, V. H.: Interrelation of Dentistry and Surgery in Treatment of Deformities of Face and Jaws. *Proc. D. Centenary Celebration*, March 1940.

4. *Idem:* Jaw Reconstruction. *Am. J. Surg.*, 43:249-267, February 1939.

5. MITCHELL, V. E.: Surgical Prosthesis. *D. Digest*, 32:665, October 1926.

6. FITZ-GIBBON, J. J.: Cleft Palate. *D. Items Int.*, 53:737, October 1931.

7. BULBULIAN, A. H.: Repair of Facial Defects with Prosthesis Using Latex Compound. J.A.D.A. 28:559-571, April 1941.

8. CLARK, C. D.: Moulage Prosthesis. *J. Lab. & Clin. Med.*, 26:981-992, February 1941.

9. OLINGER, N. A., and AXT, E. F.: Surgical Prosthesis and Oral and Facial Defects. *Am. J. Surg.*, 31:24-37, January 1936.

10. ACKERMAN, A. J.: Protective Appliances for Oral Cavity and Face During Radiation Therapy. Vol. 1, chap. 28, pp. 494-507; Prosthetic Reconstruction of Face and Mouth Following Cancer Therapy. Vol. 1, chap. 29, pp. 508-520; in PARK, G. T., and LIVINGSTON, E.: Treatment of Cancer and Allied Diseases. Ed. 1. New York: Paul B. Hoeber, Inc., 1940.

11. BODINE, R. L.: Maxillofacial Prosthesis. *Internat. J. Orthodontia.*, 14:998-1010, November 1928.

A NEW TYPE OF PORCELAIN BRIDGE AND THE TECHNIC FOR ITS CONSTRUCTION

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FOR more than sixty years, porcelain has been employed in dental bridge prosthesis. A period of such length has provided an unusual opportunity to study and evaluate this material.

A number of years ago, Albert L. LeGro wrote, "The practitioner of today is gradually coming to realize that porcelain in dentistry, aside from being exceedingly artistic, is rapidly taking its rightful place as a restorative material, second to none."[1]

Recently, Stanley D. Tylman[2] competently observed that "the biological compatability and the esthetic qualities of glazed porcelain have directed the attention of the dental profession for many years toward the possibility of constructing serviceable bridges made entirely of baked porcelain."

The porcelain bridge has always been popular with men who understood its indications. In the main, there are two types of porcelain bridge in use. One, of all porcelain, has its place where the span is short and biting conditions are extremely favorable. The second, used where the span is longer or the biting more severe, is the reinforced porcelain bridge, built around a strong metallic bar. This type, by far the most practical, when used under proper conditions, has proved stronger and more satisfactory.

Despite the frequent indications for its use and its many well-known advantages over other prostheses, the reinforced porcelain bridge is not commonly employed. Perhaps this is as much due to the specialized skill and the amount of laboratory time required for its construction as it is to the expense involved. Also to be taken into consideration are the work and expense that face the dentist and the patient when a broken pontic is to be replaced, since this procedure necessitates the removal of the bridge and often the remaking of all the pontics.

The advent, about three years ago, of a pin pontic tooth with a porcelain incisal edge and gingival border made possible the construction of a porcelain bridge closely similar, in esthetic values, to the all-porcelain reinforced bridge and with the following decided advantages over it:

Read at the Eighteenth Annual Midwinter Meeting of the Chicago Dental Society, February 22, 1944.

1. Broken pontics can be easily replaced without necessitating the removal of the bridge, as new pontics can always be ground in and fitted to the bridge structure.

2. Special skill in ceramics is no longer required because of the ease of assembly and construction by the use of these pontics.

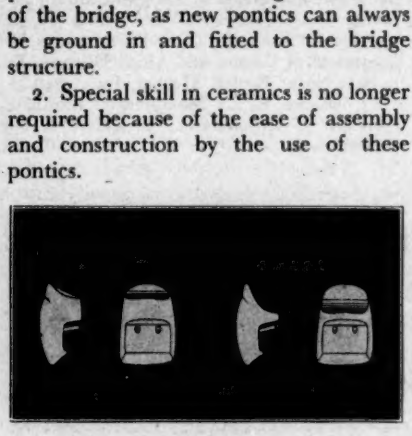

Fig. 1.—Lingual and proximal view of pontics, showing pin recess, root end (left) and saddle (right) type.

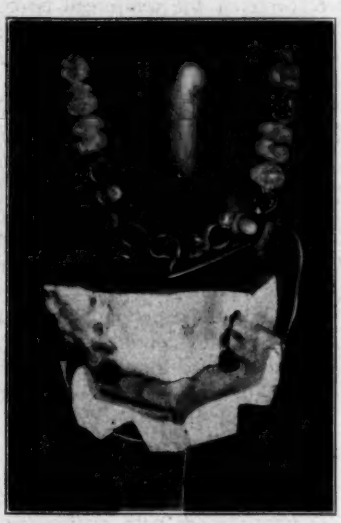

Fig. 2.—Model showing six-tooth anterior bridge using porcelain veneer jacket crowns as abutments; also impression for construction of all-veneer bridge.

3. The results are just as esthetic and yet the cost no longer is a factor.

4. If the case indicates, the dentist can have the biting portion of the pontic reinforced with strong metal, which will add protection to the porcelain in this region.

5. The teeth may be glazed or changed in any way, individually, and the entire bridge is not subjected to the danger of the furnace for any adjustment to one of its pontics.

6. The pontics can be replaced even after the bridge has been in the mouth for several years, should the color, size or any other condition demand it.

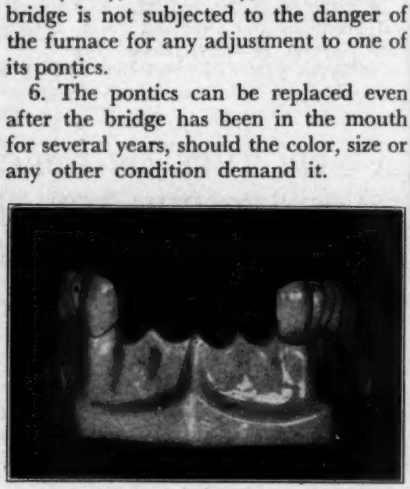

Fig. 3.—Model with abutment in place using porcelain veneer crowns as abutments.

Fig. 4.—Labial view. The teeth chosen for the case were the right width, but longer than in the completed case.

7. Replacements and repairs can be made by a dentist wherever teeth are purchasable; thus the bridge does not have to be sent for these services to a city where there is a competent ceramist.

The teeth described in this paper, for pontic uses, are all porcelain, except for the two platinum pins in a recess on the lingual surface. (Fig. 1.) This recess is

above the incisal edge of the tooth, to leave a translucent incisal edge in the finished bridge, and is a short distance below the gingival border of the lingual surface, so that when the casting, which will serve as a reinforcement, is made, it will not impair the translucence of the tooth any more than the reinforcing bar which is present in all reinforced porcelain bridges.

We see, therefore, that in this bridge the reinforcing bar is on the lingual aspect instead of being embedded within the porcelain as it is in the all-porcelain reinforced bridge.

Chosen here for illustration is a case requiring the replacement of the central and lateral incisors, using the cuspids for abutments. This is shown in Figure 2, which also shows the impression of the case. Porcelain veneer jacket crowns were used as abutments in this case and these are shown on the model in Figure 3.

In choosing pontics, the procedure is as follows:

After the width is determined, the length is so approximated that one will not have to cut away much or any of the translucent incisal tip. The teeth chosen for this case are shown in Figure 4.

Fig. 5.—Lingual view of teeth chosen for case, showing ample room to grind root ends for adaptation.

Fig. 6.—Teeth arranged and held in place by sticky wax, while plaster index is made on labial aspect.

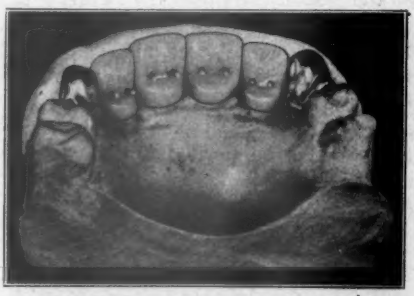

Fig. 7.—Labial index in place holding pontics in correct position while being waxed on lingual aspect.

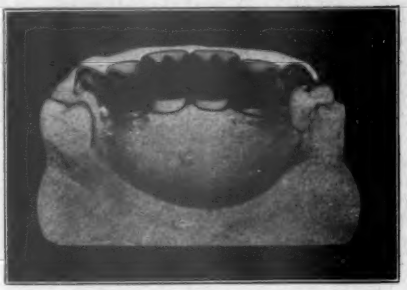

Fig. 8.—Reinforced pontics waxed and ready for casting; showing two central incisors with added reinforcement.

Second, one should so choose the length that the pins will come at about the cingulum area of the tooth. This may require some adjustments of the root end area of the pontic to permit proper adaptation of the root end. In Figure 5 is shown the lingual aspect of the teeth chosen and illustrated in Figure 4.

It is best to select a facing from 1 to 2

mm. longer than is necessary, to permit a good gingival adaptation, as is shown in Figure 4. After the teeth have been properly adjusted gingivally, their incisal edges should be in the approximate position that they will hold in the finished bridge and they also should be prepared on both the mesial and the distal aspect to assume, in all respects, their final shape and form.

The preparation on the lingual surface of the pontic comprises the beveling of all the margins. Where it has been ascertained that there is to be undue stress on the incisal edge, a triangular groove having a slightly flattened apex is cut in the center of the lingual surface starting from the incisal portion of the pin recess and continuing incisally to within

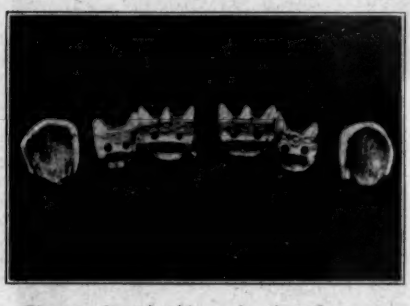

Fig. 9—Cast backings showing slot cut to connect with pin holes; also lingual castings for abutments with pin holes to accommodate porcelain facing.

from 0.5 to 0.75 mm. of the incisal edge.

It can be seen that the casting which extends up into this groove, as well as the extensions upward along the mesial and distal bevels, will act as a guard for the incisal portion against stresses which porcelain, by itself, usually does not have the strength to withstand without fracture.

One must be sure to use for backing material a suitable extremely hard casting gold. Such gold is generally labeled by the manufacturer "extra hard," having a Brinell hardness from 148 upward when bench cooled.

After the lingual portion has been prepared, the teeth are completed. The next step is to properly aline the teeth on an articulated model of the mouth, then to secure the teeth to each other and to the model on the lingual aspect by any of the well-known means, such as sticky wax, soft wax or modeling clay.

While teeth are thus being held, as shown in Figure 6, a small amount of plaster of Paris is placed on the labial

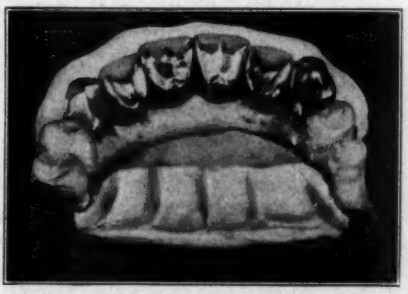

Fig. 10.—Labial index in place with pontics, and castings in place with lingual index relined for soldering.

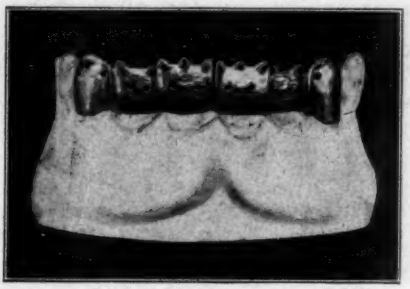

Fig. 11.—Pontics and abutments on model soldered except in median line, which is soldered later.

surfaces of the teeth and on a small labial portion of the model, including the labial portion of the cuspids, so as to furnish, when set, a means for accurately holding the teeth in their proper places on the model. This step is shown in Figure 7, and this is the place where the teeth will be in the finished case when placed in the mouth.

This holding or retaining means of the teeth is hereafter referred to as an index, for it enables the proper indexing of the teeth in respect to the model.

We can now work freely on the lingual portion and proceed by treating the lingual recesses in the porcelain with a separating medium which will not permit wax to stick to the porcelain, inasmuch as we are to take wax impressions of the lingual recesses on these pontic teeth. It is not considered advisable to

Fig. 12—Labial view of completed bridge.

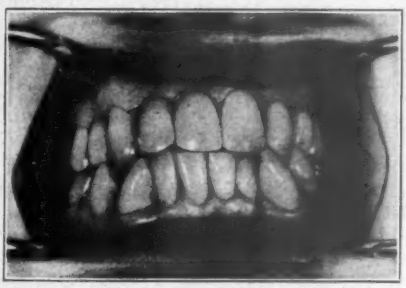

Fig. 13.—Labial view of practical case replacing upper right central and lateral incisors.

make more than two backings in one casting. In fact, it does not require much more time to construct individual backings.

After the wax has been placed in the recesses, it is properly carved to reproduce the form desired for the lingual surface, as shown in Figure 8. It is then removed, invested and cast.

There are various methods of reproducing the pin holes during the casting operation. The wire in a No. 3 paper clip is of the same diameter as the pin and the wire in a No. 4 Puritan bank pin is of the same gage as the pin. Either of these can be placed in the hole, and, after casting, be removed by dissolving in nitric acid.

A carbon point may also be used for this purpose, but this is the least desirable of all of the methods because it frequently leaves gas bubbles in the gold around the carbon points. The preferred method is to carve a small groove on the gingival aspect of the wax, deep enough to reach the ends of the pin holes, as shown in Figure 9.

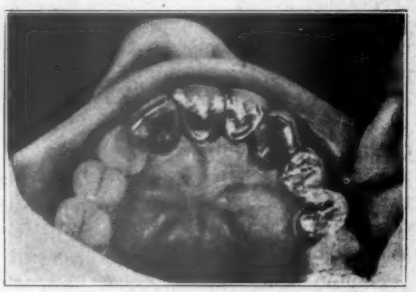

Fig. 14.—Lingual view of practical case restoring upper right central and lateral incisors with added reinforcements of pontics.

This procedure gives three worth while results:

First, the investment can run right through the pin holes, with practically no danger of trapping air, and with a good opportunity for a fine casting of the pin holes.

Second, there is a slight saving in gold.

Third, proper cementing is simplified and more or less assured because the cement runs right through these holes.

One of the difficulties in properly cementing this type of pontic where no opening into the pin holes has been created lies in failure to force the air out

of the pin holes, thereby allowing the cement to completely fill the pin holes.

Another method, of course, of constructing this type of bridge allows the pins to go right through the backing and come out on the lingual surface. This method also permits proper investment and simplified cementing and has its advantages in these respects.

The backings, having been cast, are fitted to the pontics. Then, by use of the index again, the pontics are realined, as shown in Figure 10.

At this point, it is necessary to take a lingual impression of the bridge with the backings in their proper position, pour this impression with soldering investment and proceed with the soldering operation.

It is preferable not to solder the entire bridge in one operation, but to solder it in small sections, making new indices after each soldering operation. It is also desirable to solder first the pontics nearest to the abutments and then the intermediate pontics. In Figure 11 are shown the central and lateral pontics soldered to an abutment. They will next be soldered to each other.

Although the entire bridge may be soldered on the model, it is preferable to leave one joint open until the final fitting in the mouth, where an impression is taken and poured in soldering investment. When the bridge is then finally soldered, one is assured of the maximum in accuracy of assemblage.

When soldered and assembled, the finished bridge, as will be noted, has the same appearance as in Figure 6, when the teeth were completed and assumed the shape and position that had been anticipated for the finished bridge.

Figure 12 shows the completed and assembled bridge off the model. Figure 13 shows the labial appearance of another bridge, using these pontics and this type of construction in the mouth of a patient in whom the right central and lateral incisors were restored. Figure 14 shows the lingual aspect of this same bridge.

The same indications and contraindications that are present in porcelain bridge work in general are applicable to this type of bridge as well. For example, a very close bite, especially if it is an end-to-end bite, is frequently a contra-indication. If employed in the average mouth, however, where conditions are fair, a completely satisfactory bridge, both esthetically and functionally, can be produced.

Upon viewing the esthetic and satisfactory results with porcelain bridge work, one must concur with the observation of J. L. Loop,[3] professor of ceramics at the University of Southern California, that "restorative dentistry which, after all, comprises by far the major portion of the dentist's ministrations, finds its most finished form of expression in porcelain work."

BIBLIOGRAPHY

1. LEGRO, A. L.: Ceramics in Dentistry. Ed. 2. New York: Dental Items of Interest Publishing Co., 1931.

2. TYLMAN, S. D.: Theory and Practice of Crown and Bridge Prosthesis. St. Louis: C. V. Mosby Co., 1940.

3. LOOP, J. L.: Porcelain in Dentistry. Unpublished data.

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ROOT CANAL STERILIZATION WITH THE SYNERGISTIC MIXTURE OF AZOCHLORAMID AND SULFANILAMIDE

H. JUSTIN ROSS, D.D.S., New York, N. Y.

THE vital importance of a properly treated pulpless tooth to the comfort and well-being of the patient is fully apparent. If careful and complete sterilization of pulp were attained consistently, there would be no need for discussion. The pulpless tooth would, thereby, be elevated from the character of ill repute in which it is held by some and could be retained to play a useful part in mastication.

Unquestionably, poorly treated pulpless teeth are a dangerous source of systemic involvement. For a time, recognition of the relationship of focal infection to systemic disease created a wave of enthusiasm for the wholesale extraction of teeth or tonsillectomy, sometimes with no firmer basis than mere suspicion of guilt. The results, if uniformly favorable, would fully justify such drastic measures, but too often the disease which the extraction was to cure remains.

Reimann and Havens[1] covered the point well when they said:

> The results of routine extraction of teeth and tonsillectomy for the purpose of preventing or curing systemic disease indicate in the minds of many that the practice is not justified. Controlled clinical and experimental support of the procedure is lacking. Comparing the occasional benefit obtained with the dangers incident to the operation, one is led to recommend extraction of teeth and tonsillectomy *only* in exceptional cases, when evidence of actual local disease is present and its relation to remote or systemic disease seems probable. If the presence of an abscess or chronic infection around a tooth is reasonably certain, there is no question that surgical measures are necessary in treatment of the local condition. But, in the light of present knowledge, the elimination of local infection in the hope of influencing remote or general symptoms must still be regarded as an experimental procedure not devoid of hazard.

This lack of consistently successful results of extraction has altered the conception of its infallibility as a routine procedure. The alternative is obvious: sufficient root canal sterilization in order to salvage the pulpless tooth. X-ray studies are a reliable guide to the effectiveness of bacteriologic control in root canal treatment and, if they were examined over the past several years, would show the improvements in results attained by new sterilization technics.

The importance of an adequate disinfecting agent is paramount. Too often the excellence of the root canal filling has been stressed, while the attainment of sterility in the tooth has been minimized. Mere mechanical obstruction of the root canal alone cannot prevent reinfection, which is prone to occur in the multicanaliculated and extensively aborized canal.

There are two main requirements in the treatment of root canals. The first is the effective bacteriologically controlled sterilization of the widened and mechanically cleaned root canal. The second is its complete hermetic filling, which delays reinfection, but does not, as it is often claimed, prevent it with absolute certainty.

Sterilization of the tooth is a prerequisite to the mechanical obliteration of the root canal. Failure to sterilize the dentin effectively is one of the causes of unsuccessful apicoectomy. When pulpal contents of the canal are being removed, sterilization must be done concurrently, if the apical portion of the pulp has not been infected completely, because débris is likely to be forced through the apical foramen during instrumentation. Many pulps may be necrotic in the pulp chamber and first portion of the canal and yet be vital in the apical region. Such teeth must be treated without infecting or causing a chemical irritation of the periapical tissues.

The foundation, then, for root canal treatment must be a careful, aseptic technic, perfect mechanical preparation, complete sterilization by the use of a germicide effective enough to sterilize the infected pulp without injury to the periapical tissue and complete mechanical obliteration. Grossman[2] says: "At least in some instances, the periapical area of a pulpless tooth can be rendered safe to the patient as determined by roentgenologic, bacteriologic and histologic criteria, and once rendered sterile, the periapical area will probably remain so." This accords with the rather general observation that hematogenic infection of a sterile pulpless tooth is rare.

While electrosterilization of the root canal is probably the best means available, it is time-consuming and exacting and therefore impracticable to the majority of dentists. Numerous antiseptic agents have been used with varying success.

The literature indicates that of all the antiseptics used in root canal antisepsis, the halogens have been recognized as the most successful. Chlorine in its various combinations has been the best of the halogen series, and encouraging progress was made when azochloramid was introduced into the armamentarium of dentists. Reports[3, 4, 5] have indicated that this is one of the best disinfectants yet developed for root canal sterilization. Although Pear[6] has stated that only volatile compounds can be used, it is believed that results with azochloramid, especially when combined with a penetrating wetting agent, contradict his views.

Ostrander and Hartmann,[7] having reviewed local sulfonamide therapy in dentistry, say: "The sulfanilamide derivatives have been found of unquestioned value when administered internally in the more extensive infections of dental origin. However, the exact extent of their usefulness for local application in the mouth remains to be defined."

Reports have been made on their use for many conditions, including infected pulp canals. Adams, Norris, Weiner and Yalisove,[8, 9] among others, state that local application of sulfanilamide has been valuable in root canal therapy. Most authors agree that the local application of sulfanilamide is probably beneficial in certain selected cases, but they emphasize that more intensive study and closer agreement between reports will be necessary before final scientific evaluation can be made.

Recent work on the synergistic action of azochloramid and sulfanilamide[10] inspired a trial of these two agents together. Neter[11] says, "The combination of sulfanilamide and azochloramid exerted greater bacteriostatic activity (on Group A hemolytic streptococci) than either compound alone. Used together, these two agents in suitable dilutions are more effective than four times the concentration of sulfanilamide alone, and twice the concentration of azochloramid alone."

He has also stated[12] that "in certain cases of localized infections in which treatment with sulfonamides alone fails to result in cure, the combined administration of sulfonamide and chlorine compounds such as azochloramid may yield increased antimicrobial effects."

The theory of Schmelkes and Wyss[10] attributes this increased activity to the inactivation of sulfonamide inhibitors, such as p-aminobenzoic acid and tissue débris, by the chlorine compound. They found that combinations of azochloramid and sulfanilamide, which alone do not inhibit the growth of bacilli in MacLeod's medium, inhibit the growth completely. They showed that sulfanilamide-resistant organisms apparently can be made sensitive to sulfanilamide by exposing them to azochloramid solutions in concentrations that do not bring about sterilization.

Recently, Goldberger[13] found that the addition of oxidizing agents, especially azochloramid, enhanced the activity of sulfanilamide, and the combination of azochloramid with sulfanilamide afforded excellent therapeutic results in the treatment of grossly infected wounds.

The weight of evidence from these reports, in addition to the good results obtained previously with azochloramid solution in triacetin (1:500), led me to try a combination of azochloramid and sulfanilamide.

USE OF AZOCHLORASUL* FOR ROOT CANAL STERILIZATION

In addition to the rationale of combining azochloramid with sulfanilamide discussed above, the use of sulfanilamide is also indicated because most root canal infections are caused by the presence of streptococci.[14] Sulfanilamide prevents the multiplication of bacteria that might survive between treatments. It has often been emphasized that complete penetration with the germicidal agent is essential, and this can be achieved not only by evaporation, as claimed by Pear,[6] but also by spreading, which is greatly enhanced by the addition of the wetting agent, sodium tetradecyl sulfate.[15]

The solution used contains:

Azochloramid	0.2 per cent
Sulfanilamide	2.2 per cent
Sodium tetradecyl sulfate	0.1 per cent
	(W.&T. medium)
Triacetin	97.5 per cent

It was found that when kept in a dark bottle, this solution is stable for several weeks.

The solution was used in thirty-eight cases. No effort was made to make this a controlled series. Rather than attempting quick sterilization, the aim was to sterilize subsequent sections of the root canal before they were opened, thus preparing for instrumentation without danger of spreading the contamination.

Since all cases were carefully selected as to accessibility, the use of strong agents was not necessary for opening the canal. In general, access to the canals was obtained by burs and excavators until the canals were exposed to view. The canals were opened first to within one-third the distance to the apex and azochloramid-sulfanilamide solution was sealed in as a dressing. At a subsequent visit, the rest of the canal was opened and the solution was again sealed in. Although the canals were virtually flooded with the solution, no pericementitis has resulted.

Sterile paper points were used as wicks from a pledget of cotton sealed in the pulp chamber as a reservoir. Double base plate guttapercha seals were used. Since the triacetin may prevent the guttapercha from adhering to the walls of the pulp chamber, the latter should be swabbed with chloroform. A thick rosin chloroform varnish is then applied before placing the first guttapercha seal, which should be swabbed again with chloroform before the second seal is placed.

The progress of sterilization was controlled by taking the cultures routinely. On the third visit, a culture was taken. The technic for making this culture is simple and is rather generally known, but since it has variations, a short description of the procedure used by us is given:

1. Sterilize pliers by dipping in alcohol

*Supplied by the Research Laboratories of Wallace & Tiernan Products, Inc., Belleville, N. J.

and burning off in flame two or three times.

2. Moisten a sterile paper point well with sterile tapwater or sterile physiologic solution of sodium chloride and introduce into the canal to help remove any antiseptic present (in order to minimize possible bacteriostatic action).

3. Introduce a dry sterile point to the dry canal. Discard this point.

4. Introduce a dry sterile paper point as far as possible. On removal, if its tip gives evidence of being moistened with periapical exudate, drop into a tube of sterile "hormone" broth. A fair sample of the periapical exudate must be obtained to determine an authoritative negative culture.

The use of a "hormone" broth or Rosenow's glucose-brain broth is advised because they are favorable to the growth of streptococci, which are found in about 100 per cent of periapical infections and are usually considered the significant organism in oral infections with systemic involvement.[14] A liquid rather than a solid medium is used to minimize the possible bacteriostatic effect. The tube is incubated at 37° C. for forty-eight hours. Growth is determined by microscopic examination of a smear taken from the culture.

Immediately after the culture is taken, a dry, non-medicated sterile paper point is inserted in the canal and sealed in with baseplate guttapercha. If growth occurs in the first cultures, further treatment is necessary, but if no growth appears, a second culture is taken on the subsequent visit, using the same technic. If the second culture is positive, treatment must be continued. If it is negative, one may proceed to the filling of the canal, provided there are no other contraindications.

This technic conforms with requirements as expressed by Appleton[16]: "At least two successive negative cultures (the second one after a non-medicated dressing) should be obtained before filling the canal."

Owing to its low surface tension, azochloramid readily penetrates the dentinal tubule. The acidulated starch iodide test described in an earlier paper[5] quickly verifies the presence of otherwise invisible quantities of azochloramid. The material to be investigated is brought in contact with a small quantity of potassium iodide solution acidulated with acetic acid or hydrochloric acid containing a small amount of starch solution. Azochloramid causes the solution to assume a blue to black hue owing to the development of free iodine, which forms the characteristic complex with starch.

This test was used to trace the degree of penetration of azochloramid through pulpless teeth. Freshly removed teeth from pyorrhea cases (to avoid undue strain on the tooth structure during extraction) were opened in the crown, and the pulp was removed, the canal cleared and the tooth set in a small block of cement. The root canal was then filled with azochloramid dressing as if the tooth were still in the patient's mouth. After a day or two, test borings were made through the cementum and small droplets of acidulated potassium iodide starch solution were placed in contact with the dentin at the dentinocemental junction. In most instances, the test showed that penetration of the dentin was accomplished in a twenty-four hour period under the conditions described.

CONCLUSIONS

Thirty-eight cases were treated with a solution of azochloramid, sulfanilamide and sodium tetradecyl sulfate in triacetin, and no evidence of reinfection has appeared during a follow-up period of one to three years. There were no harmful effects from multiple treatments with the preparation, such as are necessary in the case of arborized root canals.

The favorable effects attained previously with azochloramid have been corroborated by the present study and, as far as the limited number of cases permits conclusions, the azochloramid-sulfanilamide combination marks a note-

worthy improvement in the therapy of infected root canals.

The often-emphasized requirement that a disinfectant must reach all contaminated areas appears to be met in this preparation, probably by the low surface tension of the solvent, triacetin, and by the addition of an effective wetting and penetrating agent.

BIBLIOGRAPHY

1. REIMANN, H. A., and HAVENS, W. P.: Local Infection and Systemic Disease: Critical Appraisal; Case Against Indiscriminate Removal of Teeth and Tonsils. *J.A.M.A.*, 114: 1-6, January 6, 1940.

2. GROSSMAN, L. I.: Treatment of Periapical Infection by Conservative Methods. J.A.D.A., 21:1669, September 1934.

3. *Idem:* Root-Canal Therapy with Azochloramid. *D. Cosmos*, 77:597, June 1935.

4. *Idem:* GROSSMAN, L. I.: Preliminary Report on Use of Azochloramid as Root Canal Disinfectant. J.A.D.A., 23:774-781, May 1936.

5. ROSS, H. J.: Azochloramid in Root Canal Antisepsis. J.A.D.A., 22:637-646, April 1935.

6. PEAR, J. R.: Bactericidal Effects of Some Drugs Used in Pulp Canal Therapy. J.A.D.A., 29:244, February 1942.

7. OSTRANDER, F. D., and HARTMANN, F. W.: Local Use of Sulfonamides. J.A.D.A., 29: 1051-1064, June 1942.

8. ADAMS, F. R.: Technique of Treating Periapical Infections with Sulfanilamide. *D. Items Int.*, 63:329, April 1941; Filling of Pulp Canals. *Ibid.*, 63:639, July 1941.

9. NORRIS, W. H.; WIENER, J. A., and YALISOVE, I. L.: Sulfanilamide—Local Application in Dentistry. *Delaware M. J.*, 12:118, May 1940.

10. SCHMELKES, F. C., and WYSS, O.: Inactivation of Sulfonamide Inhibitor by Azochloramid. *Proc. Soc. Exper. Biol. & Med.*, 49:263-267, February 1942.

11. NETER, E.: Combined Bacteriostatic Activity of Sulfanilamide and Azochloramid upon Group "A" Hemolytic Streptococcus and Enterococcus. *Proc. Soc. Exper. Biol. & Med.*, 47:303-305, June 1941.

12. *Idem:* Effects of Sulfonamides Used in Conjunction with Azochloramid in Localized Infections. *Am. J. Surg.*, 58:69-72, October 1942.

13. GOLDBERGER, H. A.: Potentiation of Sulfonamides in Local Therapy of Wounds and Surgical Infections by Use of Oxidants. *Am. J. Surg.*, 56:353-374, May 1942.

14. APPLETON, J. L. T., JR.; BRYANT, C. K., and ZEBLEY, E.: Relative Frequency of Streptococcal Types in Periapical Infection. *D. Cosmos*, 78:336, April 1936.

15. KINTZ, F. P.: Traumatic Wounds of Soft Tissues of Face with Preliminary Report on New Azochloramide Solution, and a New Modified Sulphanilamide Solution. *Mil. Surgeon*, 89:60-69, July 1941.

16. APPLETON, J. L. T., JR., and BRYANT, C. K.: Laboratory Guide in Bacteriology; Particularly for Students in Dentistry. Philadelphia: Lea & Febiger, 1928, p. 532.

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UPPER AND LOWER IMPRESSION TECHNIC AS DEVELOPED IN THE MT. SINAI HOSPITAL DENTAL DEPARTMENT

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DURING the many years in which prosthodontia has been practiced, the various technics employed in impression taking have been altered and improved. I had my first contact with impression technics at the time when a beeswax impression with a plaster wash was in vogue and full plaster impressions were becoming passé. Since that time, compound muscle-trimmed impressions, compound impressions made with plaster of Paris, adjusted trays with zinc oxide paste and adjusted trays with low fusing compound have been employed. The method of impression taking employed in the clinic of the outpatient department of Mt. Sinai Hospital will be presented here, without consideration of the bite-taking technic or the final processing of the denture. The procedures to be described are not startling or revolutionary. The technic is not an exclusive one, but takes into account a knowledge of the anatomy of the mouth and the employment of this knowledge to assure the comfort of the patient in wearing dentures.

The clinic previously treated from fifty to sixty patients a day (half-day session), but the large attendance was the result of the great number of adjustments that had to be made. Two weeks after we took over the clinic, all patients who were considered to be coming back perhaps unnecessarily for adjustments were referred to the prosthodontist for a careful examination of the dentures. Correction was made by relining, rebasing or remaking, as necessary. In some cases, the dentures were found to be properly adjusted, the patient simply having come back to the clinic because he enjoyed doing so. These "mental health cases" were dismissed, and adjustments are now so few that they do not encroach on the time needed for denture construction.

Since denture adjustment is in itself regarded as demanding practical training, this service was rotated among the men on the service.

The technic is divided into three main divisions:

1. Examination of the mouth. Most dentists are so eager to begin work that they give little time to this step. A few minutes spent in examination of the mouth will save many hours at the chair spent in making adjustments.

2. The tray. A modeling compound impression is taken and, in almost all instances, this impression is prepared to serve as the tray.

3. Completion of the impression. An oxyeugenol-resin wash impression is taken in the prepared tray.

On the theory that the degree of retention of a denture is in direct ratio to the area covered without encroaching on the surrounding musculature, adhesion as an active force of leverage is gained by extending the borders of the denture over the greatest area. The

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greater the area, the greater the resistance to masticatory force. Since suction is considered dangerous, it is limited by (1) adequate horizontal stability, (2) adequate adhesion, (3) occlusal stress and (4) processing of the denture.

EXAMINATION

1. The limits of the metal tray are gaged and the amount of compound necessary to take the impression is estimated. 2. The labial frenum is noted to determine whether it is attached so tightly to the crest of the ridge as to require frenectomy. 3. The buccal frenums are examined, the operator noting how long and how strong their attachment is to the ridge. 4. The sharpness and prominence of the anterior papillae and rugae are noted. 5. The amount of buccal space between the maxillary tuberosity and the muscles laterally from the space is noted. 6. The depth of the hamular notch and the space distally from the maxillary tuberosity are determined. 7. The vibrating line as the posterior limit of the denture is noted. 8. Whether a torus is present is next noted. 9. The fovea palatinae is examined. The time consumed in making the detailed examination can be considered as well spent.

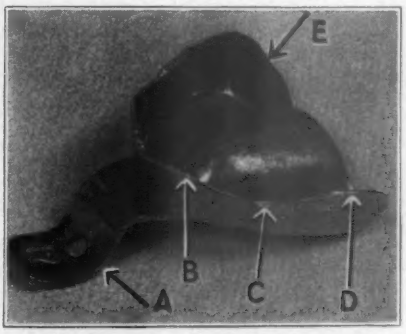

Fig. 1.—Adjusted tray. a, handle bent away from upper lip. b, labial flange. c, bicuspid flange. d, molar flange. e, built-up flange for hamular notch.

UPPER COMPOUND IMPRESSION FOR A TRAY AND TRAY ADJUSTMENT

A tray of the usual size is adjusted so that the lateral wall in the molar area is higher than the bicuspid labial area. The heel of the tray is adjusted so that it follows the general direction of the hamular notch past the tuberosity. (Fig. 1.) A roll of well-softened compound is placed in the tray, extending from tuberosity to tuberosity, the central distal palatal area of the tray being left free of compound. The roll of compound is formed so as to extend well above the metal limits of the tray. (Fig. 2.) The tray is now placed in position in the mouth and pressed upward, first at the heels and then in the anterior region. Too much pressure should not be exerted as the metal of the tray should be well below the highest portion of the compound. The patient then muscle-trims the compound by smiling, yawning, puckering the lips and drawing on the operator's finger as he holds the tray in position. The tray is then chilled and removed.

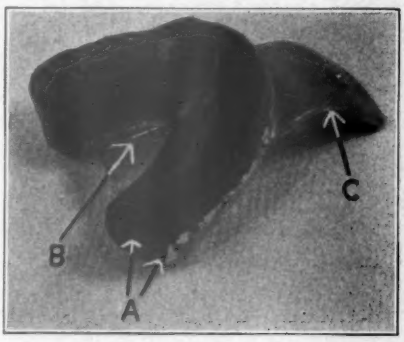

Fig. 2.—Roll of compound in tray. a, height of compound above metal tray. b, open area of tray free of compound. c, handle bent away from lip.

With a pencil, the highest limits of the compound are indicated. This line, which discloses the registrations of the muscles and the tissues as they bend over the labial and buccal surfaces of the

compound, must extend from the hamular notch on one side to the hamular notch on the other. All excess compound from the buccal and labial aspects up to this penciled line is cut away. (Fig. 3.) When the compound impression is reinserted to gain an accurate muscle trim, as much as possible of compound can be eliminated, and any distortion of the surrounding musculature can be overcome, with greater ease, and thereby full-functioning peripheries will be assured.

If the metal tray was of the proper height and too much pressure was not exerted, the metal tray can now be used as part of the compound tray and it is not necessary to remove it. The tray handle must be bent so that it will not interfere with muscle-trimming of the anterior region under the upper lip and the labial frenum. In case of interference, the tray must be removed. The metal handle can then be attached to the compound on its under side parallel with the compound; or a cast can be made, with a shellac baseplate and handle; or a vulcanite tray can be made, but this is not very economical for clinic work.

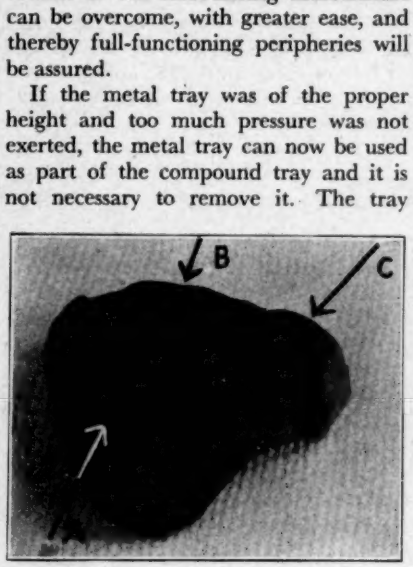

Fig. 3.—First compound impression. a, side trimmed to penciled outline. b, penciled outline. c, untrimmed side.

If the compound impression can be used, it is now corrected and muscle-trimmed. Starting at either tuberosity, we soften a small area of compound in a bunsen flame or by means of a torch, place the impression in the mouth and instruct the patient to muscle-trim as before. This procedure is repeated until there is a smooth rounded border the thickness of which can be approximated by judging the buccal space, the finger having been placed in this area during examination of the mouth. This correction insures valve seal. Now the treatment is continued in the molar-biscuspid region, until muscle movement is registered. In the labial area, it is necessary to observe the width, length and height of attachment of the frenum. Too active muscle-trimming in this area may cause a lack of valve seal and a break in the full-functioning peripheries. If the latter are not well rounded, a forward movement of the denture in masticatory excursions may result. The treatment is continued on the other side of the mouth.

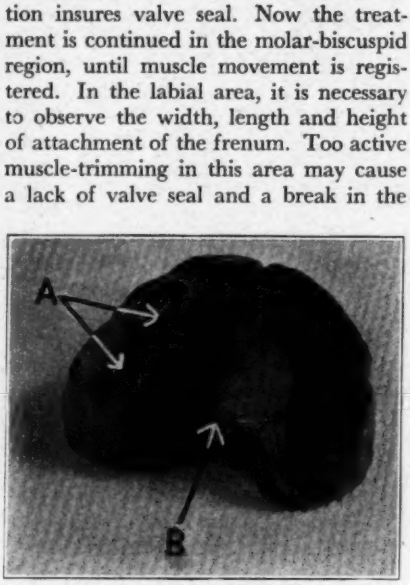

Fig. 4.—Muscle-trimmed upper impression. a, areas of recent extraction. b, compound postdam.

Muscle-trimming is extended into each hamular notch. Inaccuracy or short borders in this area will surely cause trouble later.

Now the vibrating line is checked. In almost all instances, this line will mark the posterior limit of the finished denture. In order to correct this area, the

patient must go through the motions of swallowing, yawning and saying "ah."

If the fovea palatinae is well represented, it should be included within the posterior limit of the impression and denture. If a torus is present, the posterior limit of the impression is brought backward as far as possible beyond the distal limit of the torus, without affecting the patient's comfort. Some discomfort will be experienced, but the patient will learn to overcome it in a short time. (Fig. 4.)

When the foregoing operations are completed, the impression, if processed, should give valve seal as there are now full-functioning peripheries and horizontal stability, since the greatest possible area has been covered without encroaching on the surrounding musculature and ending the impression on soft tissues; but we do not have equalized adhesion, for the impression does not afford equal compression of the tissues. Therefore, an impression with a soft, slow-setting wash material is necessary, one that will flow away from hard areas and indicate compression in soft areas, registering adaptation to the underlying tissues and relief where necessary.

LOWER COMPOUND IMPRESSION FOR A TRAY AND TRAY ADJUSTMENTS

On examining the mouth this time, an effort is made to get a mental picture of the oral cavity and the mandible, noting (1) the anatomy of the labial frenum and buccal frenums; (2) the limits of the external oblique line distally from the distobuccal corner (in this buccal area, the flexibility of the buccinator is noted as it moves distally and medially over the anterior face of the ramus, also the flexibility of the masseter muscle as it extends from the zygomatic arch to the angle of the mandible); (3) the compressibility of the pear-shaped pad on the face of the ramus; (4) the anatomy of the mylohyoid ridge; (5) the depth and compressibility of the floor of the mouth in the molar lingual area, as it is formed by the mylohyoid muscle; (6) the compressibility of the tissues covering the sublingual glands in the bicuspid-cuspid area, and (7) the depth and compressibility of the area just lingually from the anterior region, limited in its depth by the geniohyoid and genioglossus muscles. Also, in this area, the lingual frenum is noted, as well as the development of the genial tubercles.

We are now ready to take a modeling compound impression for a tray. A tray of usual size is adjusted so that it bends upward on the heels to follow the shape of the mandible as it approaches the face of the ramus over the pear-shaped pad. In this way, an impression of the pad is obtained without undue compression. The molar buccal area widens to include all the area up to and including the external oblique line and the attachment of the muscles to this line. At the distobuccal corner, the tray forms an oblique angle to follow in the direction of the buccinator muscle as it moves distally and medially. The

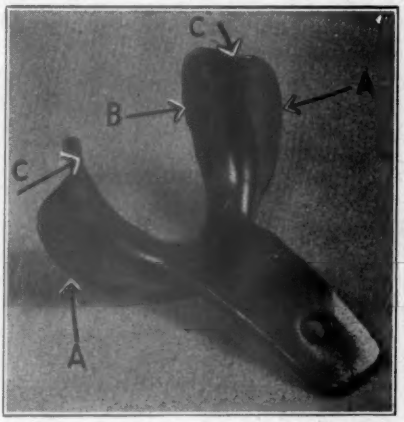

Fig. 5.—Adjusted lower tray. a, molar flange built out to external oblique line. b, molar lingual flange built down into floor of mouth past mylohyoid ridge. c, tray bent up on heels to relieve compression of pear-shaped pad.

lingual molar flange is long, in order to go well beyond the mylohyoid ridge down to the floor of the mouth. The bicuspid flange is shortened. The anterior flange is longer than the bicuspid, for length in this area is important for stability. (Fig. 5.)

After the tray is selected and adjusted, a roll of softened compound is placed in it. In height, the compound should be well above the metal limits of the tray. The tray and compound are placed in position in the mouth and pressed first in the anterior region and then on the heels. As stated before, pressure should not be too great. Now the patient is instructed to muscle-trim the compound by pushing the tongue forward, into the right cheek (to trim the left side), into the left cheek (to trim the right side), then to touch the upper lip and last to touch the palate on the right, left and center.

All these muscle-trimming movements for both the upper and the lower trays are made with the mouth opened just a little or half open, as this position permits more accurate registration of the movements of the muscles in masticatory excursions than is possible with the mouth closed or open. The highest limits of the compound are now penciled in and all excess up to this outline is trimmed away.

Muscle-trimming is started at the distobuccal corner, with an effort to keep this border in line with the buccinator muscle. This correction will give this angle an oblique turn from the distal aspect. In the molar-bicuspid area, the compound fills out the buccal space up to and including the external oblique line, so that the buccinator folds over this periphery. At this point, the upper surface of compound in this area is scraped out or dished away, to help the muscles to fold over a thin, but rounded border of compound. Now, the buccal frenum is carefully muscle-trimmed, and, next, the labial frenum and the anterior area are trimmed. The other side of the mouth is similarly treated. The impression is extended onto the soft pear-shaped pad, the portion of the pad to be included within the impression being arbitrary. At Mt. Sinai Hospital, usually about one-third of the pad is included. Once we have decided how much of the pad is to be included, the distal lingual border becomes a perpendicular line dropped from here to the floor of the mouth. On entering the molar lingual area, the mylohyoid ridge must be passed and the compound reach the floor of the mouth, registering the mylohyoid muscle in movement. The patient is asked to move the tongue as before. Next, the bicuspid area is muscle-trimmed, and then the anterior region, which is to be kept as long as possible.

Often, when difficulties are encountered in muscle-trimming or the patient is not cooperative, we change the order of muscle-trimming by completing the buccal aspect of one side and then the lingual aspect of the other side. This procedure stabilizes the tray somewhat, acting as a lock.

The muscle trimming of the opposite lingual areas is now completed. At this time, we have two muscle-trimmed compound trays with horizontal stability and full-functioning peripheries, but not enough equalized adhesion, as we have not allowed for the compression of soft areas and the relief of hard areas under the tray. Therefore, a wash impression must be taken in a soft, slow-setting material that will register adaptation and relief.

COMPLETION OF THE UPPER IMPRESSION

Before the wash impression is taken in the upper prepared tray, compound must be scraped away wherever there are undercuts, to allow for greater strength in the greater bulk of material to be placed in the undercut area. The sharp tips of the rugae and the anterior papillae are cut down to avoid too great

compression of them. If a torus is present, this area is scraped lightly. Scraping will prevent the squeezing of too much material onto the soft area from the hard area and thus prevent undue compression of the soft areas.

THE WASH IMPRESSION

For the wash impression, an oxyeugenol-resin impression paste is employed. This comes in two tubes and an equal amount from each is placed on a slab and mixed and the mixture is placed on the palatal surface of the tray. It is then spread over the entire surface of the tray, and when the mixture has lost its stringiness, the tray is placed in position in the mouth, where it is pressed upward with a minimum of pressure and allowed to remain two or three minutes, when the patient is requested to muscle-trim as before. He is then asked to bring the jaws together, leaving the mouth only slightly open, and then to again make the muscle-trimming movements.

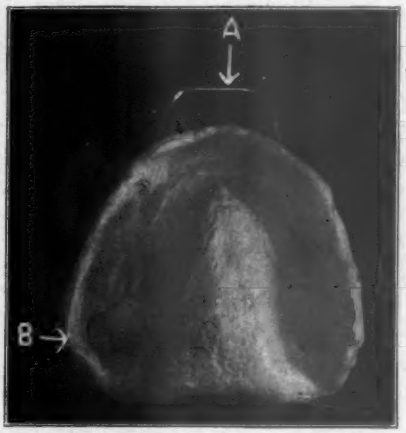

Fig. 6.—Completed full upper impression. A, metal handle added to compound tray. Because of a shortage of trays and the inability to obtain the right tray, it was necessary to remove the metal tray. B, area that fills in buccal space between maxillary tuberosity and muscles laterally from space.

The impression is now removed from the mouth, and if no compound shows through, it can be completed by again being placed in the mouth, this time under greater pressure from the fingers holding the impression in position, while the patient again performs the muscle-trimming movements. At this time, we can assist in the muscle-trimming by gently moving the cheeks in the usual manner. Removal of the impression by having the patient blow it down or by playing a stream of compressed air over the buccal border is preferred to other methods of removal, such as a downward pull on the handle.

The impression is left out of the mouth for one minute, then replaced and subjected to greater pressure. The patient can assist by exerting downward pressure against the upward pressure from the operator's fingers. This is carried out four or five times, with progressive increase of pressure. This procedure can be practiced as often as considered desirable, since the material is slow setting, never really becomes hard and is hygroscopic. These operations carried out while the material is slowly setting afford an equalized compression, for when the impression is replaced each time in the mouth under increased pressure, only a little of the slow-setting material is

Fig. 7.—Completed full lower impression.

squeezed from the hard areas onto the soft areas for compression. Hard pressure at the first insertions would squeeze too much material from the hard areas onto the soft areas, causing undue compression of these soft areas and a drop in the denture.

Postdamming can be secured in one of two ways. After the vibrating line and the postdam area are located, the lines are indicated with an indelible pencil. The impression is replaced in the mouth and an indelible outline of the postdam area will be seen. Now we can (1) add thinned impression paste made by the addition of a little vaselin to the material before mixing within this area on the impression and replace it in the mouth, exerting great pressure, or (2) pour the model and scrape it in the region where postdamming is desired.

If, on the first removal of the impression from the mouth employing impression paste, some compound should show through, the compound is scraped away for a depth of 2 to 3 mm. This area, if not scraped, would later be a source of irritation and the stability of the denture might even be reduced.

A smaller mix of the impression paste is now made, with a little vaselin added to make the paste softer and to retard setting. Now when the impression with the addition of the new mix is replaced and pressure is exerted, the new and old mixes become one. These corrections are made as often as necessary. When no compound shows through, the impression is completed as before suggested. (Fig. 6.)

COMPLETING THE LOWER IMPRESSION

All undercuts are scraped away as before and some compound along the crest of the ridge, especially if it is knife-edged, is scraped or burred away. Some compound is also scraped away along the mylohyoid ridge. In older patients, owing to absorption of the alveolar bone, the mental foramen and mylohyoid ridge may be high up. These areas must be relieved.

A mix of the impression paste is made as before and the material is placed on the lateral walls of the tray only—*not* on the crest of the ridge. When placed in position, the paste will crawl upward to the crest of the ridge without undue compression of the crest or the pear-shaped pad on the face of ramus, and without undue compression or distortion of the tissues of the vaults of the mandible.

The case is continued as before, with all necessary adjustments if compound should show through. (Fig. 7.)

With proper adaptation, we have now added equalized adhesion to the horizontal stability and full-functioning peripheries obtained before. If the bite registration technic is adequate and the final processing of the denture is correct, many chair hours normally spent in adjustments should be saved.

CONCLUSION

When we meet with trouble in denture prosthesis, we have only to go back over our technic carefully to discover that, somewhere along the line, we took a short cut or overlooked something. However, this much we can say: The social service figures at the hospital and the laboratory figures have proved that remaking, relining and rebasing, always a great expense, have been materially reduced. We have also eliminated from the service the great number of patients who returned week after week and month after month for adjustments.

POSTWAR PROBLEMS IN ORTHODONTIA

FREDERICK B. NOYES, D.D.S., Chicago, Ill.

IT is probably true that problems of the future are already present and that their seeds can be traced far into the past. What the social and economic conditions in the postwar period will be, no one can tell. They may be progressive, they may be reactionary, they may be gradual and they may be violent, but every one seems to agree that there will be changes.

We do not even know when the postwar period will begin, but I am afraid that it will not be so soon as we all wish. It seems possible that there will not be so great a change in outlook between January 1, 1944 and January 1, 1945 as there was between January 1, 1943 and January 1, 1944.

As we attempt to look at the future, it seems probable that the demand for orthodontists and orthodontic service will increase, and the ratio of orthodontists to general practitioners will increase. While the need for dental service among the adult population will probably not decrease, the development of caries control will eventually reduce the incidence of dental caries and reduce the demand for dental restorations, changing the character of dental service. The concentration of attention upon the dental care of children for the purpose of reducing the dental ills of the adult in the next generation will also have the effect of directing attention to orthodontic troubles in children, and by so doing will increase the demand for service. While the improvement in health and nutrition and the concentration on the means of caries control will undoubtedly reduce the incidence of dental caries, the continued and increasing mixture of genetic lines of descent is likely to increase the incidence of malocclusion. In this way, the demand for dental service will change, and the demand for orthodontic service is almost sure to increase. The need for training more orthodontists is already imminent and will certainly be one of the major postwar difficulties.

The problem of caring for the patients of men called into the service of the armed forces is one that will undoubtedly cast its shadow into the postwar period. About one-third of the dentists in the United States are or will be in the service of the armed forces. Of these, the orthodontists are in about the normal proportion. The dentist can leave his office and his patients to the care of his brother practitioners with comparative ease, and the civilian practitioner can keep the patients from suffering serious dental damage by temporary operations and prophylactic methods until his return, even though that might be delayed for several years. The orthodontist is in a very different situation. All of his patients have entered upon treatment programs which extend over considerable periods of time. Often the discontinuance of treatment will result in the loss of everything that has been gained, and even in the case becoming more complicated than it was originally. To take over the treatment of an orthodontic patient in the middle of treatment is often, if not usually, more difficult than to begin at the beginning. For an orthodontist to get his patients into a condition in which they can be left without dam-

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age requires several months at least.

It is extremely important, therefore, to provide a longer period between the time when an orthodontist is called to service and when he is obliged to leave his practice for induction, but even if such conditions can be arranged, a great responsibility will fall upon the orthodontist left in the civilian service. These men should be willing to make every sacrifice to help their brothers called to service to protect their interests in every possible way and to allow the minimum of difficulty and damage to their patients.

It is quite evident that war conditions have imposed problems upon orthodontic practice and that these will cast their shadow into the future. First, the calling of men into the armed services has reduced the ratio of orthodontists to the civilian population, and this will necessarily increase the demand for service from the men who are left. Nothing is more detrimental to the interest of the patient than the overcrowding of a practice. Satisfactory treatment of an orthodontic patient requires not only careful thought and consideration while the patient is in the chair, but also study of records, review of progress and the determination of underlying causes, when the patient is not in the chair. Time for professional study can be provided by delegating routine technical procedures to trained assistants. At present, this is almost impossible, for the professional man cannot compete in compensation with war production and commercial programs.

Second, the elimination of unemployment and the very great increase in the income of the middle and lower income groups have made possible orthodontic service to a large group of people to whom it was previously impossible, but these people have had little experience with high grade professional services and cannot understand the difference between technical seryice and professional service. In other words, they have acquired improved financial conditions and have also acquired a desire for something that they were not previously able to obtain, but have not attained the ability to judge the value of the thing that they desire. The result is a tendency to reduce professional compensation.

Third, the people above the middle or the upper income groups have suffered a reduction in income and have experienced the necessity for change in occupation. They feel so positively the increased burden of taxation that they hesitate to assume any new financial responsibilities and do not feel that they can do the things that their family formerly enjoyed without any careful consideration. Consequently, the people who appreciate the value of orthodontic service feel the necessity of reducing the cost. The result of all of these things is to increase the burden of practice upon the professional man, to decrease the appreciation of the value of these services on the part of his clientele, to greatly increase his costs and his overhead and to make obtaining supplies, materials, and assistance more and more difficult, and all of these conditions added together tend to reduce the standard and quality of service.

Most people who think much about the present or the future are inclined to believe that, in the changing social and economic structure, professional service, which medicine and dentistry have been teaching the people to value and desire, is sure to be extended to the lower income groups with the assistance of funds derived from private charity and from taxation. In this extension of professional service, it is important that the service shall not be allowed to degenerate. Of all types of professional service, orthodontia will find it most difficult to prevent this lowering of standards; first, because of the difficulty in finding properly trained men, and, second, because of the inability of those who will direct such professional service to understand

the requirements of good orthodontic service.

Extension of service will require increased educational facilities in order to prepare the men to render the service. Orthodontic service cannot be assisted by the use of trained technicians to the extent that this is possible in other branches of dentistry. The solution of this educational problem cannot be discussed here, but there certainly are ways by which it can be accomplished.

I wish that I could be as optimistic as some in regard to the duration of the war. I know that it will go on longer than we wish and probably longer than we expect. The orthodontists who have been called into the services have shown distinct ability to adapt themselves to conditions, and many of them have risen to important positions of responsibility, but these positions are, of course, not in the line of orthodontic service. A few men stationed in the larger posts at training camps, where there are a considerable number of officers who are in comparatively stable positions and consequently are able to have their wives and family with them, have some opportunity to render orthodontic service for the families of the officers, but even here conditions are not stable enough to render such service very satisfactory. Certainly, orthodontists called into the service must look forward to a rather prolonged period in which their services, however valuable, will offer little or no opportunity for orthodontic service or even an occasion to use the special skill acquired from such service. When mustered out, these men will have to face a rather serious situation. Probably they will arrange themselves in three groups.

The first group will be those whose training and experience in the armed services have given them knowledge and experience that will enable them and incline them to go into some other specialty. Probably, most of these men, as was the case in the last war, will decide to go into facial and oral surgery; but, in spite of their military experience, they will need training and education to fit them for surgical service to the civilian population. It is encouraging to me to note the attitude of the Administration and Congress in furnishing opportunity for special study and education for those who desire and need it. Just as the men who went into the armed services required special and intensive training and education to fit them for their work in the Army and Navy, so the men who are mustered out still need special training and education to fit them again for civilian service, and it is to be hoped that such opportunity will be furnished at government expense.

The second group, and probably the larger number, will decide to go back to their old specialty. They will have been entirely out of practice, perhaps for a considerable period, and they also will need opportunity for refresher courses and a chance to regain their former skill. The problem of providing and arranging such postwar education and training is not easy and will require careful consideration and study on the part of institutions and educators. Unless they are planned and arranged for before the time comes, there is little probability that satisfactory programs will be worked out on the spur of the moment.

The third group, the men who went into the service directly after graduation from professional schools, will need a different kind of professional education and training before they will be fit for civilian practice. If they are going back into general practice, they will require an extensive refresher course with an opportunity for regaining lost skill. If they decide to go into a specialty, such as orthodontia, and probably some of them will so decide, they will need a thorough course of training in the specialty, which they have never had. This must include both its scientific funda-

mentals and the development of technical skill and clinical practice. Such a program will require at least a year.

Orthodontic education has always been a difficult problem. Originally, courses in orthodontia, or "regulating" as it was called, were an ornament to the dental curriculum. Graduates could go out and practice dentistry very successfully and not have anything to do with it. It was not unlike the condition of the specialties in the medical schools at that time. The man who graduated in medicine did not expect to go out and treat diseases of the eye and the ear, nervous disorders and insanity. If he was interested in any of these fields, he sought an assistantship with some distinguished specialist and obtained this education with him as a preceptor. In the dental school, orthodontia was not required for graduation, and there were no men practicing it as an exclusive specialty. Consequently, few students gave it much if any consideration. It was not until sometime in the nineties that two men, Calvin S. Case in Chicago and Edward H. Angle in Minneapolis, began the exclusive practice of this specialty. In the medical school, the teachers of the specialties gave their services to the school, not with the expectation of making ophthalmologists, for example, but in the hope that the young graduates would be able to treat the simplest conditions and would refer all real problems to his old professor. With orthodontia, the conditions were practically the same, but at first there were no specialists.

Dr. Angle made a serious attempt to teach orthodontia in at least three dental colleges, with complete failure. He was attempting the impossible. You cannot make a man learn anything or even study it unless he is interested and gives it his attention. Nine-tenths of the men in the classes had no interest in orthodontia, and never expected or intended to have anything to do with it. Dr. Angle attempted to force them to study it and the result was revolt, so he resigned.

Dr. Angle's enthusiasm for his profession and his faith in its value to humanity drove him to what I consider one of the most remarkable experiences in professional education in the history of dental education. He went about to professional meetings and, through his friends, selected young men whom he considered to be of intelligence and capability. He brought them to him for three months of intensive study and training. He inspired them with enthusiasm and his love for his profession and drove them with the force of his personality. Because he had a broad and deep concept of his field, he gathered about him men to teach what he considered the fundamentals upon which the practice rests: anatomy, histology, embryology, comparative anatomy and art. The result was that he sent men out all over the country, many of whom continued not only to practice but also to study. It was truly a great educational effort.

The distinguished educator and dean, the late E. C. Kirk, of the University of Pennsylvania, once said to one of the men who had studied with Angle and had graduated in dentistry from the University of Pennsylvania: "How in the world does that man take you fellows who are just ordinary dubs in the dental school and make honest-to-goodness students and men out of you?" It was his vision, his enthusiasm and the driving force of his personality. Largely through the men that he developed, orthodontic education has come back to where it belongs in the university and college of dentistry; and, here again, it meets the old problems and difficulties.

Partly at least as a result of the success of Dr. Angle's school, there are a multitude of short courses purporting to prepare man to practice special fields in dentistry; all sorts of subjects, not only orthodontia, but also local anesthesia, extraction, minor surgery, porcelain jacket

crowns, denture work, etc. Many of these represented such flagrant prostitution of the educational process that they became a stench in the nostrils of the profession, were discredited and now have almost entirely disappeared. The normal function of such courses has been taken over by the universities and educationally minded societies, but unfortunately some of the courses offered by dental schools and universities are subject to almost as great fundamental criticism as the original proprietary predecessors.

One of the principal reasons for the difficulties in orthodontic education has been the radically and fundamentally different viewpoints of different groups. First, the dental schools considered orthodontia as a small and minor phase of dentistry, requiring no special fundamental training and a comparatively simple technic. They undertook to train men to practice it even as a specialty on the basis of from 2 per cent to 4 per cent of the entire curriculum of the college of dentistry.

Second, at the opposite extreme, Dr. Angle's great ambition was to make of orthodontia an independent, autonomous profession, bearing the relation to dentistry that dentistry bears to medicine. He wished to make this education independent even in the preprofessional work and then to offer four years of orthodontia, instead of four years of general dentistry. He recognized more clearly than most that, in orthodontia, we are dealing with abnormality or perversion of growth, that there are no pathologic conditions involved and consequently the practice rests fundamentally upon knowledge of growth rather than knowledge of pathologic processes.

Third, there was developed a sort of compromise, due, I believe, to Dr. Angle's contact with and influence on Guy S. Millbury, producing curriculum II in the College of Dentistry at the University of California. The student may choose either curriculum in the dental school, but curriculum II qualifies him only for the practice of children's dentistry and orthodontia. This program has enjoyed some measure of success.

Fourth, some of the universities have undertaken to develop orthodontic education on the graduate plan, putting the work under the direction of the graduate faculty of the university rather than the dental faculty of the dental school. This has probably been the most successful program, but any graduate program must rest upon the foundation of undergraduate work, and the inadequacy of the teaching of orthodontia in the undergraduate dental course has seriously handicapped the graduate program of teaching and has made it necessary to have it include some material that is strictly undergraduate.

Fifth and finally, the short course persists, given either by universities or in private courses. Since every dentist passing state board examinations is legally licensed to practice orthodontia, and since a man's ability is not determined or limited by his training, it is evident that at least some men coming from short courses will become excellent specialists.

In view of the complexity of the needs of men returning from the armed service, it seems certain that there is nothing in organized education in the school that would, at present, meet their requirements. There are men interested and active in orthodontic education in these institutions who are capable of solving this problem. I only ask that it be studied and that effective plans for solution be developed before the time comes when this need will be imperative. I have reviewed the development of orthodontic education and the influences that have affected it in the hope that, in facing postwar educational problems, some of the old mistakes can be avoided.

55 East Washington Street.

LOCAL USE OF SULFANILAMIDE AND SULFATHIAZOLE IN EXTRACTION WOUNDS

LEONARD WEINER,* A.B., D.M.D., Tucson, Ariz.

IN a preliminary report,[1] the data presented were indicative of the fact that sulfanilamide and sulfathiazole should be used prophylactically after the extraction of teeth. However, owing to the small number of cases presented, 1,065 extractions, the data were not conclusive. This paper presents additional and similar data which, when combined with those previously published, permit such conclusions.

The methods were those of the preliminary report with the following exceptions:

1. Whereas, in the original experiment, an attempt was made to secure as many patients as possible with multiple extractions, in this instance no such attempt at selection was made.

2. Previously, most of the patients had entered the hospital because of systemic disease rather than oral disease, with the result that 25.7 per cent were poor surgical risks. In the present series, almost without exception, the patient was in excellent physical condition.

3. In this report, only 60 per cent of the extractions were performed aseptically. The rest were carried out under field conditions, often in a combat area. In the field, antisepsis and cleanliness rather than asepsis were the rule.

4. Owing to primitive conditions and the unavailability of laboratory facilities, no material for culturing was taken from the sockets, clinically diagnosed as infected. Bacteriologic studies could not be made.

TABLE 1.—PRESENT DATA

	Extractions			Infected Teeth			
	Upper	Lower	Total	Upper	Lower	Total	Per Cent
Control	220	247	467	0	5	5	1.08
Sulfathiazole	222	211	433	0	0	0	0.00
Sulfanilamide	198	242	440	0	0	0	0.00

A total of 1,340 extractions were performed. Of these, 467 were controls in which no sulfonamides were used; 433 sockets were packed with sulfathiazole after the extractions, and 440 were packed with sulfanilamide. None of the sockets in this series that were given prophylactic chemotherapy became infected postoperatively, while five of the control sockets became infected, though not in a single case did the infected socket reach the condition clinically recognized as alveolalgia, or "dry socket."

CONCLUSIONS

1. The use of either sulfanilamide or sulfathiazole prophylactically is of defi-

*Captain (DC), AUS.

nite value in the prevention of postoperative infection in the extraction wound.

2. Owing to the extremely low incidence of postoperative infection in extraction wounds in the maxilla, none in this series and but one in every 503 extractions in Archer's[2] series were infected. It is inadvisable to routinely use sulfonamides prophylactically in the maxilla.

3. In every instance, whether in the mandible or in the maxilla, the use of sulfonamides prophylactically should not be routine. Rather, the use of these agents should be based on the area of the operation, the type of extraction, the amount of trauma, the systemic condition of the patient and the degree of infection present before the operation.

TABLE 2.—PRESENT AND PREVIOUS DATA

	Extractions			Infected Teeth			
	Upper	Lower	Total	Upper	Lower	Total	Per Cent
Control							
Previous report	201	142	343	0	5	5	1.46
This report	220	247	467	0	5	5	1.08
Total	421	389	810	0	10	10	1.23
Sulfathiazole							
Previous report	169	212	381	0	1	1	0.26
This report	222	211	433	0	0	0	0.00
Total	391	423	814	0	1	1	0.12
Sulfanilamide							
Previous report	177	164	341	0	0	0	0.00
This report	198	242	440	0	0	0	0.00
Total	375	406	781	0	0	0	0.00

BIBLIOGRAPHY

1. WEINER, LEONARD: Local Use of Sulfanilamide and Sulfathiazole in Extraction Wounds, Preliminary Report. *Mil. Surgeon*, 90:157, February 1942.

2. ARCHER, W. H.: Analysis of 226 Cases of Alveolalgia. *J. D. Res.*, 18:256, June 1939.

Station Hospital, Davis Monthan Field.

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OCTOBER 1 *Editorial Department* 1944

THE EFFECT OF FLUORINE ON DENTAL CARIES

THE discovery of the relation of a low-caries rate to the fluorine content of drinking water opened up a field of tremendous importance to those in dentistry and in public health work who are endeavoring to solve the problem of dental caries.

In our long and as yet profitless search for a mass preventive for dental caries, we have followed many promising leads, only to find them intriguing mirages. The latest lead in this direction is the caries-fluorine hypothesis, which is based upon the theory that, inasmuch as it has been found that the presence of fluorine in the drinking water has a retarding influence upon dental caries, fluorides may be employed therapeutically as a mass preventive of dental caries.

As far back as 1916, when that grand old pioneer of advancement in dentistry, G. V. Black, in association with F. S. McKay, presented his epoch-making studies on the rôle of fluorine in producing mottled enamel, the subject has been one that has invited investigation by the dental researcher. The studies on the subject conducted by H. Trendley Dean, of the United States Public Health Service, led to a nation-wide

effort to eliminate the principal source of mottled enamel; namely, excessive amounts of fluorine in the drinking water, and the efforts of the United States Public Health Service in this field have been notable for their widespread beneficence.

Dr. Dean presented the results of his studies on the effect of the fluoride concentration in community water supplies on the incidence of dental caries in 1939, and his work immediately attracted the attention of numerous research workers, particularly those who were endeavoring to solve the problem of the etiology of dental caries.

In the study of the rôle of fluorides in producing mottled enamel, it was found that teeth so mottled were less susceptible to caries than the teeth of persons living in areas where the drinking water was free of fluorine. This discovery led to an intensive study of the relation of fluorine to dental caries, and the findings have led to wholesale and indiscriminate use of fluorides as a corrective of the carious process in the teeth, without regard to its possible baneful effects upon the teeth and other tissues of the body.

Research from the point of view of the relation of fluorine to caries has definitely determined that the use of drinking water containing certain amounts of fluorine will cause a disfiguring mottling of the enamel; that elimination of fluorides from the drinking water will stop the occurrence of this mottling effect; that this mottling is permanent when once it occurs and, too, that drinking water containing not more than 1.0 parts per million of fluorine will not have any mottling effects on the enamel of the teeth. It has also been determined that the carious process in teeth so mottled is definitely and quite perceptibly retarded and, in some instances, checked entirely.

The latter discovery has attracted the widespread attention of health workers and dentists, and efforts are now being made to apply fluorides topically to the teeth as a curative agent against dental caries, reportedly, in some instances, with success.

Comparison made by Arnold (J. A. D. A., April 1943) of the dental caries picture in children living in communities where the water contains not more than 1.0 parts per million and that of children living in communities using fluoride-free waters show that: (1) about six times as many children show no dental caries experience; (2) about a 60 per cent lower dental caries experience rate exists, and (3) there is almost a 75 per cent decrease in first permanent molar loss.

While these data are certainly speculatively attractive as leading to

possible mass treatment of caries, our knowledge of the subject certainly does not warrant the introduction of fluorine in community water supplies generally.

Sodium fluoride is a highly toxic substance, and while its application in safe concentrations, and under strict control by competent personnel, may prove to be useful therapeutically, under other circumstances it may be definitely harmful.

To be effective, fluorine must be ingested into the system during the years of tooth development, and we do not yet know enough about the chemistry involved to anticipate what other conditions may be produced in the structure of the bone and other tissues of the body generally.

We do know that the use of drinking water containing as little as 1.2 to 3.0 parts per million of fluorine will cause such developmental disturbances in bones as osteosclerosis, spondylosis and osteopetrosis, as well as goiter, and we cannot afford to run the risk of producing such serious systemic disturbances in applying what is at present a doubtful procedure intended to prevent development of dental disfigurements among children.

With regard to the safety margin in the fluorine content of drinking water, the reported amount of fluorine in the water cannot be taken as the criterion for the amount taken in the system, as in an intensely hot climate much larger quantities of water would be imbibed and hence a much larger quantity of fluorine would be taken into the body. Another feature of the complex problem that demands consideration, in attempting to take advantage of the therapeutic value of fluorine, is the quantity absorbed by the system at various age periods of life.

M. C. Smith and H. V. Smith, in their studies at St. David, Ariz., found that, of the people using drinking water containing 1.6 to 4.0 parts per million of fluorine at the ages 12 to 14, 33 per cent had caries; at ages 21 to 41, nearly 100 per cent had caries; from 24 to 41, 50 per cent had all teeth extracted and replaced by dentures. The authors concluded from these data that the teeth of the individuals of a community in which comparatively large amounts of fluorine are found, in this case say 1.6 to 4.0 parts per million, are structurally weak; in some cases, the tooth structure being so impaired as to crumble on attempts to place fillings. (*Am. J. Pub. Health*, 30:1050, September 1940.)

Because of our anxiety to find some therapeutic procedure that will promote mass prevention of caries, the seeming potentialities of fluorine appear speculatively attractive, but, in the light of our present knowledge

or lack of knowledge of the chemistry of the subject, the potentialities for harm far outweigh those for good.

DENTAL PROSTHETIC SERVICE PROGRAM

TIME calls for serious consideration of the dental prosthetic service problem. We represent the second largest health profession in America. Through proper application of the biologic and technical knowledge of dentistry, we coordinate these sciences to meet the exacting requirements of present-day oral health needs. The profession and the public have benefited by our efforts and achievements. The dental laboratory adjunct has profited by our progress.

From time to time, it becomes necessary to take inventory of our status as a profession and consider the philosophic, ethical and professional phases of our calling. Delinquency, if not checked, results in retrogression. Subversive activities in prosthetic service have been called to our attention repeatedly.

Many and varied solutions to the prosthetic service problem have been projected by men within and without the profession. Only a few within our profession are in practices and positions in which the rendering of an adequate prosthetic service has become distasteful. Currently, a few plans have been proposed that are incompatible with the wisdom that has directed our profession along a safe and sound course. They serve a purpose, however, in crystallizing the profession as to what is good and what is bad for it and the public. The bulk of dental work is still done by the rank and file of every-day practitioners, who give final disapproval of these projected theories.

The dental technician is a valuable adjunct to the profession and is another assistant to us in our practice. The commercial laboratory is the agency which hires and trains the technician, sees that he is surrounded by sanitary working conditions, sees that the technician is adequately paid and receives and processes our prescriptions. They, too, are assistants and serve the profession.

With the complexities of democratic societies, problems always arise. Each in its turn must be solved. Illegal practices have crept in with the processing phases of prosthetic service. Many times, these practices have been entered into through mere thoughtlessness on the part of some

practitioners. Our state journals are now calling attention to the illegal and unethical practice of sending patients directly to laboratories for denture repair and calling upon the convenience of dental technicians in performing the intra-oral phases of prosthetic procedure. Such acts are illegal. They aid and abet the technician in the illegal practice of dentistry. Then we have the racketeering and bootleg type of technician and dental laboratory dealing directly with the public. Our state boards of dental examiners are now warning the profession, the laboratories and the dental technicians of these illegal practices.

Why a few, both within and without the profession, clamor for licensure of technicians and registration of dental laboratories as a cure-all for illegal practices in dental prosthetic services is beyond understanding. Our present dental practice acts, when properly enforced, are adequate to take care of all of these illegal activities. State health agencies that diligently safeguard the public health are dubious about these legislative proposals because, to them, they appear to be largely influenced by the lure of economics. This too vindicates the profession's opposition to registration and licensure. Dentistry is primarily interested in public health and welfare. Continued aggression of these misconceived and speculative philosophies will again arouse the ire of the profession and only impede the establishment of the desired profession-laboratory-technician relationship.

In 1940, the House of Delegates approved the appointment of a dental prosthetic service committee to work out a possible solution to this problem. The main objectives of this working committee have been to bring about a better professional-laboratory-technician relationship. Notable progress has been made. Through the efforts of the committee, the principles embodied in a code of ethics acceptable to professional concepts have been projected and the movement is gaining momentum. This is the first step toward quasiprofessional stature within the laboratory adjunct. The findings of the committee have forewarned the profession of the dangers to it and to the public in legalizing the status of those not qualified to practice dentistry. The profession has heeded that warning.

At the October meeting, the House of Delegates will be presented with a voluntary plan for accreditation of dental laboratories which is intended to bring about desirable relations, understanding and cooperation between the dental profession and the dental laboratories. It involves no legislative action and constitutes a dignified professional

proposal for cooperation, which a majority of laboratories have always given even without official recognition by the dental profession.

The following are only a few of the steps in the evolution of the profession: improvement in our educational curriculum through accredited dental schools; elimination of charlatans and quacks through anti-advertisement laws; improvement in dental materials through the work of the National Bureau of Standards; elimination of objectionable nostrums from accepted remedies through action of the Council on Dental Therapeutics, and now the elimination of evils in the field of dental prosthetic service by accreditation of dental laboratories.

Our past achievements made us what we are; current decisions will determine our future. Now that we have become alert to the fact that we have the prosthetic problem to solve, we shall solve it in the best interest of public health and welfare.

BIBLIOGRAPHICAL

Bacterial Infection with Special Reference to Dental Practice

By J. L. T. APPLETON, B.S., D.D.S., Sc.D., Professor of Bacteriopathology and Dean, Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania. Third edition. Revised. 498 pages, 86 engravings, and 5 plates. Philadelphia: Lea & Febiger, 1944.

ANY one desiring to study dental aspects of bacterial infection should begin by reading this scholarly, authoritative book. The revised edition is doubtless the most comprehensive textbook on the subject which is available today. The author states that the purpose of the book is to aid the reader in forming a comprehensive concept of infection, and to point out how this concept will help the dentist in understanding and solving his problems. The book is divided into three parts, the first concerned with general principles of bacteriology, including methods and technics, the second with the nature of infection and the body defenses against infection and the last (180 pages) devoted to special infections of the oral cavity.

The book is lucidly written, and enlivened with the philosophy of the author. An excellent bibliography is included in footnotes on practically every page.

All those seriously interested in dentistry, whether as teachers, students or practitioners, should find this book helpful in the study of bacterial infections of the oral cavity.

M. K. H.

Oral Histology and Embryology

Edited by BALINT ORBAN of the Foundation for Dental Research of the Chicago College of Dental Surgery School of Dentistry, Loyola University. 342 pages with 262 text illustrations including four color plates. Price $6.50. St. Louis: The C. V. Mosby Co., 1944.

MODERN trends in dental education demand comprehensive text and reference books written with a background of basic biologic principles, and an understanding of the clinical applications of these principles. Such a book is "Oral Histology and Embryology," edited by Balint Orban and written by him and eighteen contributors.

The method of compiling this text was

unique. The first draft of each chapter was prepared by a recognized authority on the specific subject, and each author's manuscript was submitted to all other contributors for editing. Furthermore, each one submitted his best photographs so that the final result is a well-organized and complete text. The material includes embryology of the face and oral cavity, as well as the histologic details of the dental structures. Also included are excellent chapters on the oral glands, temporomandibular joint and maxillary sinus.

The 262 illustrations are of a high caliber and are well reproduced. Each chapter includes a short bibliography and a section on "clinical considerations" in which the authors point out the correlation between histology and clinical dentistry.

This book deserves wide use as a text and as a reference book in oral histology and embryology and every dental library should include at least one copy.

M. K. H.

A Basis for the Theory of Medicine.

A. D. SPERANSKY. (Translated from the Russian by C. P. Dutt.) New York: International Publishers, 1943.

SCATTERED parts, and particularly pages 384-386 of this 452 page book may be of interest. The work is an attempt to set forth the findings and basic propositions drawn from studies on animals in which trauma to a particular part of the brain was experimentally produced. The general effects of such trauma were the production of changes simulating systemic disease, and the alteration of the course of inflammatory diseases. The studies of the rôle of the nervous system in disease led Speransky to the assertion that underlying all disease processes is a nervous or "neur-dystrophic" factor. Some of the earliest manifestations of "nervous dystrophy" appeared as lesions of the buccal mucosa, gums and, the authors write, teeth. Noticing the similarity between the disease as seen in the dog and human pyorrhea, associates of Speransky treated twenty-five patients with pyorrhea by "lumbar blockade." A favorable result was obtained in nearly all of the patients. It is interesting to note that in part of the group, increase in the severity of symptoms preceded improvement. Other investigators are reported by Speransky to have concurred in results when lumbar blockade was used as the sole treatment of pyorrhea.

W. F. BARRIFIELD.

Poemettes of the Hour.

By HAZEL DUNCAN. Price $2. Chicago: The General Printing Co., 1944.

MISS DUNCAN'S book is different from most books of verse in the respect that she uses almost exclusively the very shortest forms, couplets and quatrains predominating. Though unpretentious, the verses are nonetheless refreshing. All of them might be classified under the general heading of "light verse," although it would probably be more correct to call them humorous or whimsical verses. There is, however, no posing or attitudinizing, and, for that reason, the verses strike the reader as a natural and spontaneous expression of one who has a fine zest for living and an unaffected sense of humor. The little book is very easy to read.

Some of the verses have a whimsical mood not unlike that at times indulged in by Milne and Carroll. Some have delicate feminine charm.

Poetry, like music, is written on various levels of achievement. One does not expect in a minuet the qualities of a symphony. The important thing is the full exploitation of the form. The verses give the feeling that Miss Duncan has said what she wanted to say in the way she wanted to say it. For that reason, "Poemettes of the Hour" is a successful venture.

ANDERSON M. SCRUGGS, D.D.S.

Dr. Scruggs is a practitioner of dentistry of Atlanta, Georgia, and has attained considerable fame in the literary world for his two books of poems, "Glory of Earth" and "Ritual for Myself." (Macmillan Co.).—ED.

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Meeting of the House of Delegates

OCTOBER 16, 17, and 18, 1944

CHICAGO, ILL.

The opening session of the House of Delegates will convene at 10 a.m., Monday, October 16. The second session will be held at 2 p.m., Monday, October 16; the third session at 2 p.m., Tuesday, October 17, and the fourth session at 1 p.m., Wednesday, October 18.

The four sessions of the House of Delegates will be held in the North Ball Room, Third Floor, Stevens Hotel.

The Credentials Committee will register Delegates and Alternates beginning 10 a.m., Sunday, October 15, at the Stevens Hotel.

Reservations should be made direct with the hotel.

HARRY B. PINNEY, Secretary.

WAR SERVICE COMMITTEE

ARMY SPECIALIZED TRAINING PROGRAM FOR DENTAL STUDENTS

WE quote here the opinion rendered by Brig. Gen. Frank T. Hines, Administrator of Veterans Affairs, Veterans Administration, Washington, D. C., in the matter of benefits under the GI Bill, for dental students discharged under the Army Specialized Training Program and who have elected to continue their dental studies.

"With further reference to the letter of August 4, 1944, from the Assistant Administrator, Maj. O. W. Clark, concerning the eligibility provisions of those persons who have been pursuing Army Specialized Training Program courses in dentistry, I have to advise that in an opinion rendered by the Solicitor, based upon the Act and the legislative history thereof, it is held that one whose sole service in the armed forces consisted in continuation of his chosen professional course in college, which course was not interrupted by military necessity but, in fact, is continued at the student's own choice in civil life, which choice is evidenced by election to apply for discharge from the service in lieu of continuing in active military duty, is not eligible for educational training under the provisions of Servicemen's Readjustment Act of 1944.

Very truly yours,
(Signed) Frank T. Hines,
Administrator."

There is disagreement with the aforementioned opinion rendered by the Veterans Administration, and a protest has been lodged by the chairman of the War Service Committee with that agency.

In the meantime, President Wells has requested an opinion from the attorneys of the American Dental Association on this matter, and every effort is being made to bring about a reversal of the attitude. Dental schools will be promptly advised when the matter is finally decided.

C. WILLARD CAMALIER, *Chairman.*

POSTWAR PLANNING QUESTIONNAIRE

THE War Service Committee has today begun distribution of the questionnaire on pages 1370 and 1371 to all members of the dental profession in the armed forces of the United States, whether in the continental United States or overseas.

The respective chiefs of the dental services in the Army, Navy, Public Health Service and Veterans Administration are cooperating wholeheartedly in the distribution of the questionnaires and the committee expresses on behalf of the association appreciation to these officials for their efforts in this regard.

It is felt that the returns from this questionnaire will indicate quite clearly the interest of the American Dental Association in its members and others in the dental profession, and will result in the securing of valuable data on which to base recommendations for the postwar era. Several points stand out predominantly; namely, the opportunity for the men to express themselves on the vital subject of refresher courses, the expression of their desire to teach, loca-

AMERICAN DENTAL ASSOCIATION
POSTWAR PLANNING QUESTIONNAIRE

Prepared by War Service Committee
Room 311, 1726 Eye St., Northwest
Washington 6, D. C.

GENERAL INFORMATION

1. Graduate of _____ (Dental School) City _____ State _____

2. Year of birth _____ 3. Year of graduation _____ 4. Year of licensure _____

5. States in which licensed _____

6. Date entered on active duty _____ 7. Number of months service _____

8. Service (check): Army ☐ Navy ☐ U.S.P.H.S. ☐ Vet. Admn. ☐

CIVILIAN STATUS BEFORE ENTERING SERVICE
(Check appropriate items)

9. Entered service from: Dental school ☐ Internship ☐ Private practice ☐
Private practice combined with salaried position ☐ Salaried position ☐

10. Community of practice: City _____ State _____

If from private practice or private practice combined with salaried position

11. Type of practice: General ☐ Special ☐ Specify specialty _____

12. Number of full-time hygienists employed _____

13. Number of full-time assistants (non-dentists) employed _____

14. Number of full-time dentists employed _____

15. Number of complete dental outfits now owned _____

(a) Additional items required:

Chairs ☐ Units ☐ Engines ☐ X-ray machines ☐

Other ☐ (Specify) _____

If from salaried position or private practice and salaried position

16. Place of employment: Dental school ☐ Hospital ☐ Industry ☐
State or local department of health or of education ☐
Government ☐ (Specify) _____
Employed by dentist ☐ Other ☐ (Specify) _____

POST WAR PLANS
(Check appropriate items)

17. Do you plan to receive additional training after discharge from service? Yes ☐ No ☐

18. If yes, training desired:
Refresher course ☐ Specify length of course (months) _____
Postgraduate course ☐ Specify length of course (months) _____

19. Fields of training desired:

Orthodontia	☐	Prosthetic	☐	Anesthesia	☐
Periodontia	☐	Crown-bridge	☐	Plastic surgery	☐
Oral surgery	☐	Children	☐	Public health	☐
Operative	☐	X-ray	☐	Other ☐ _____ (Specify)	

20. Where would you prefer to study?

_____ (Name of institution) _____ (City) _____ (State)

21. Do you plan to teach? Yes ☐ No ☐

22. Specify field of teaching _____

23. Would you take a position as a dentist in industry? Yes ☐ No ☐

24. If yes, full-time ☐ part-time ☐

25. Would you take a position in a state or local health department, school clinic, etc.?

Yes ☐ No ☐ (If yes, specify) _____

26. Do you desire to remain in government service? Yes ☐ No ☐

27. If yes, Army ☐ Navy ☐ U.S.P.H.S. ☐ Veterans Administration ☐

28. Do you plan to engage in private practice? Yes ☐ No ☐

29. If yes, in former locality ☐ in new locality ☐

30. If new locality, what is your preference:

Name state _____

Size of community: Under 5,000 ☐ 5,000-25,000 ☐ 25,000-100,000 ☐ Over 100,000 ☐

31. Would you like to become associated in private practice with a group of dentists? Yes ☐ No ☐

32. Would you go to an area needing dentists if you were provided with: an office ☐ a subsidy ☐ a loan ☐ (One or more may be checked).

33. List the important ways in which the American Dental Association can aid the returning dental officer:

_____

_____

_____ (Sign or not, as you prefer)

Return completed questionnaire to War Service Committee, American Dental Association, Rm. 311, 1726 Eye St., N.W. Washington 6, D. C.

tion of future practice and ways that the American Dental Association may be helpful.

When the information has been properly assembled and compiled, it will then be made available to other interested committees of the association and to such state societies and others who may request it.

C. WILLARD CAMALIER, *Chairman.*

BUREAU OF PUBLIC RELATIONS

FEDERAL-STATE COLLABORATION IN A PUBLIC HEALTH DENTAL PROGRAM

R. C. WILLIAMS,* M.D., Washington, D. C.

RELIABLE dental surveys of recent years consistently and conclusively show that dental disease and lack of dental care are widespread throughout the nation. Findings of the Selective Service examinations made known in the early days of the present war well illustrate the deplorable oral conditions that exist in this country. Of the first 2,000,000 men examined, 8.3 per cent were disqualified for general military service because of defective teeth.[1] To avoid mass disqualification of selectees, it became necessary to lower dental requirements to the point that they were all but abolished. Thousands of dental cripples are now entering the armed services monthly where their oral defects are being corrected sufficiently to enable them to perform their military duties.

The one bright spot in the whole picture is that, as a result, a significant proportion of the population is at last receiving adequate dental care. The magnitude of this reparative service is indicated by the following figures. It has been estimated that Army dentists are working on 94,000 patients a day and that the average patient requires five or six fillings in addition to other dental services.[2] Since Pearl Harbor, the Army Dental Corps has placed more than 31,000,000 fillings and has inserted more than 1,075,000 new dentures and 56,000 bridges.[2] In addition, more than 220,000 denture repairs have been made and 3,235,000 prophylactic and pyorrhea treatments have been given.[2]

Dental surveys further show that poor oral conditions are characteristic not only of men of draft age, but also of younger people. A survey made by the Public Health Service in Hagerstown, Md., in 1937, indicated that a representative group of grade-school children have an average of five and one-half carious permanent tooth surfaces and that of every five cavities developing among school children each year, one is filled and four are neglected.[3] From the findings of this survey, it was estimated that the elementary school children of Hagerstown required five times the amount of dental service that they were receiving to care for decayed teeth alone.[3]

Surgeon General Thomas Parran recently pointed out that whenever any disease is so widespread in the population, so serious in its effects and so costly in its treatment that the individual can-

*Assistant Surgeon General, Bureau of Medical Services, U. S. Public Health Service.

Read before the Pennsylvania State Dental Society, Scranton, May 4, 1944.

not deal with it himself, it becomes a public health problem. The physical effects of dental disease are not confined to discomfort of the oral cavity, but also tend to impair the total physical health. Dental diseases can and do impair the digestive processes. Secondary effects are nerve disturbances, facial deformity, impaired physical efficiency, and even heart disease. Dental disease attacks about half the child population by the second year of life and has reached almost 100 per cent at maturity.[4]

The cost of treatment is a definite barrier to adequate dental service in a large part of the population. Analysis of data collected in a survey of 9,000 families indicated that persons in families with an income of $5,000 or more had approximately ten times as many fillings placed in carious teeth as did families with incomes of less than $1,200 a year.[5] A survey conducted in Detroit, Mich., by the U. S. Public Health Service in 1935-1936 revealed that 42 per cent of professional persons in that city reported having been to the dentist during the survey year, while less than 17 per cent of the unskilled workers had visited a dentist.[6]

TABLE 1.—FUNDS BUDGETED FROM ALL SOURCES FOR DENTAL HYGIENE AT THE STATE LEVEL AND PROPORTION OF CONTRIBUTIONS FROM TITLE VI FUNDS FOR FISCAL YEARS INDICATED*

Year	All Sources	Percentage of Total Health Budget (From All Sources)	Percentage of Title VI
1939†	$ 187,377.52	0.37	0.60
1940	474,559.65	0.57	0.75
1941	685,365.60	0.63	0.78
1942	849,505.09	0.71	0.92
1943	1,027,012.75	0.81	0.93

*Data taken from the annual report of the Surgeon General, U. S. Public Health Service for the years indicated.

†Data prior to 1939 are not comparable since reporting of funds from federal sources other than Title VI was not required.

Recognition of dental disease as a major public health problem by the professions and the public has increased in recent years. That little has been done to improve oral conditions in the general population is due to a number of difficulties well known to the profession. Nevertheless, there has been developed the machinery whereby a considerable amount of the burden of dental disease can be lifted through cooperation on the part of the dental profession and the organized public health services. Public health dentistry is of fairly recent origin.

The basis of public health dentistry today is the financial support of local, state and federal governments.

Collaboration of local, state and federal authorities on national problems has been recognized as a sound procedure for many years. An early precedent for this type of collaboration occurred in 1829 when a need of communication between the eastern and western states arose. The federal government built the roads that made commerce between the east and the west possible and thus aided greatly in the development of the west. In turn, the responsibility for the administration and the maintenance of these roads rested with the states. In the educational field, a similar instance is found in the land-grant college system, established in 1862 and still in effect today. Through the Morrill Act of 1862, Congress gave to each state 30,000 acres of land for each representative and senator to which the state was entitled. This land was sold and the revenue used for the support of colleges that would train young people in the practical sciences.[7] In 1890, provision was made for annual federal appropriations to the land-grant colleges.[7]

As disease does not recognize boundary lines, in order to prevent and control epidemics and to bring many communicable diseases such as malaria, typhoid and the venereal diseases under control—in short, to safeguard the health

of the nation—it has been necessary likewise for local, state and the federal government to work together in public health programs. For the first time in the health field, federal funds in substantial amounts became available to the states under Titles V and VI of the Social Security Act, 1935, for the establishment and maintenance of state and local health services, maternal and child health programs and services to crippled children.

The Social Security Act of 1935 is divided into eleven parts called titles and it is mainly through two of these titles, namely V and VI, that funds for health purposes are made available to those states which meet the requirements.

Title V, which is administered by the United States Children's Bureau, is in several parts, the first two of which grant authority for the activities under the maternal and child health programs and the crippled children's division. Under this authority, a considerable amount of dental work has been accomplished in improving the health of many mothers and children, especially in rural sections.

Title VI of the Social Security Act is administered by the United States Public Health Service and, as you know, was designed to assist the state and local governments in establishing and maintaining adequate public health work.

The method by which Title VI funds are allocated makes possible the strengthening of state health services according to the size of the population served, the economic status of the state and the special health problems in the several jurisdictions. Part of these grants must be matched dollar-for-dollar by the states. Under Title VI, much care has been exercised to increase state and local participation in health programs. The programs are controlled by the states. It is specified, however, that no funds paid to a state pursuant to Title VI shall be used to replace state or local funds in such a way as to effect a conservation or reduction of appropriations for health work by state and local governments.

Under the stimulus of these federal grants, commendable progress has been made toward a national health program. The number of counties in the United States that had local health departments under the direction of a full-time medical health officer has increased from 762 in 1935 to 1,828 in 1942.[8]

Shortly after the passage of the Social Security Act, dental programs were established for the first time on an administrative basis equal to that of other functions of state health departments. Public health officials realized that no health service is complete unless it includes a dental service. In 1933, only twelve states included some form of dental activity in their health programs.[9] Within the first two years of actual operation of the Social Security Act, this

TABLE 2.—TITLE VI: PAYMENTS, EXPENDITURES AND CASH BALANCES—PENNSYLVANIA

	Balance Forwarded	+ Payment	= Total Available	Expenditure	Percentage of Total	Cash Balance
1936		$61,588.33	$61,588.33	$ 7,344.23	11.9	$54,244.10
1937	$54,244.10	383,700.00	437,944.10	356,089.60	81.3	81,854.41
1938	81,854.41	432,703.00	514,557.41	421,512.88	81.9	93,044.53
1939	93,044.53	460,456.00	553,500.53	394,224.83	71.2	159,275.70
1940	159,275.70	552,117.30	711,393.00	581,227.88	81.7	130,165.12
1941	130,165.12	643,100.00	733,265.12	716,982.98	92.7	56,282.14
1942	56,282.14	622,100.00	678,382.14	604,161.40	89.1	74,220.74
1943	74,220.74	537,891.00	612,111.74	458,358.94	74.9	153,753.25

number had increased to 35. By 1943, forty-four states and the District of Columbia had made provisions for dental service in their official health organizations.[10]

In 1939, the total amount of funds budgeted from all sources for dental hygiene at the state level was $187,377.52, which represents 0.37 of the total health budget. Of Title VI funds, 0.6 per cent were allocated for dental hygiene. For purposes of contrast, corresponding figures for last year are of interest. In 1943, a total of $1,027,012.75 was budgeted from all sources for dental hygiene work in the states. This represents 0.81 per cent of the total health budget. More than 0.9 per cent of Title VI funds were allocated for dental hygiene. Although a yearly increase is shown in funds budgeted for public health dental care, the amount budgeted for this purpose is still less than 1 per cent of the total budgeted for health work from all sources. On this point, an editorial in the April 1, 1943 issue of the JOURNAL OF THE AMERICAN DENTAL ASSOCIATION makes the following comment: "While the percentage of the fund allotted to dentistry is not so large as could be desired as compared with that for all other health fields when divided among the forty-eight states, there are some states that have not availed themselves of the use of these funds and the monies have had to be turned back to the general social security fund."

Although the need for corrective dental work in all age groups in every state is apparent and recognized, and although limited funds are available for this work, many states show an unexpended balance at the close of each year. Payments to the states are made on a quarterly basis. One fourth of the total allotment, plus a 10 per cent cushion, is paid to the states the first quarter. Regardless of the amount of the year's grant, the payment for the second quarter cannot exceed the amount the state spent during the first quarter. The third and fourth payments cannot exceed the amounts expended by the states during the second and third quarters, respectively. At the end of the fiscal year, unexpended balances of all states are pooled and reallocated for the ensuing year in accordance with the basic grants-in-aid formula. This reallocated amount is added to the state's allocation from the new appropriation, but the state's unexpended balance is charged against this combined fund. Thus, if the state's share in the unexpended pool is only $10,000 and the deduction is $15,000, the state will have $5,000 less than it planned in its next year's allotment.

Since 1936, the Pennsylvania State Health Department has had unexpended balances from Title VI of considerable size from its annual budget at the close of each year. The total amount available for the fiscal year 1939 was $553,500.53; and, at the end of the year, $159,275.70 remained as an unexpended balance. In 1943, a total of $612,111.74 was available. At the end of the year, $153,753.25 had not been expended.

The situation in Pennsylvania is not unusual. It is generally agreed that, at the present time, an important method of controlling dental disease is by treatment; i.e., filling teeth. Few dental societies and few public health officials have clearly recognized the fact that the cost of dental service is the hurdle which must be obviated before the profession and organized public health services can successfully cope with this problem. Education of children as to the need for dental care is good, but does not provide fillings for teeth if the parents are unable to meet the cost. What is needed is utilization by public health workers and the dental profession of the facilities and funds available for organized health services, and development of some mutually satisfactory method whereby treatment is provided without cost for those who cannot afford it or at a cost com-

mensurate with the ability of those who can afford to pay something.

At the present time, the majority of dental hygiene programs in state health departments consist chiefly in educational activities. A few provide examination and prophylaxis for elementary school groups. Still fewer extend this service to some of the high schools. Not more than twenty-four states even propose to fill children's teeth, and available information indicates that, in about half of this number, this service is no more than a proposal on paper.[11]

A well-planned program of public health dental care, on the other hand, presents the local dental practitioner with an excellent opportunity to participate actively, on a part-time basis, in the reduction of dental disease by treatment of the most vulnerable group; namely, school children, especially high school children, many of whom will soon be entering the armed services.

The results of research may eventually obviate mass corrective treatment, if some method is found to prevent, or reduce the incidence of, caries. Already, research on the fluorides in water offers great promise in this direction. For the present, we must rely on remedial work to improve the oral health of as many people as our dental programs can reach. We all know that the long-range objective of a public health dental program should be to prevent the loss of teeth and improve and maintain oral health in all age groups. This would be a difficult task under the most favorable circumstances. Wartime conditions render it more difficult. Although the dental profession is hampered today by problems ranging from lack of personnel to scarcity of necessary materials and equipment, I believe it to be of paramount importance to the national health that public health dental work be continued and, in many cases, expanded during the war years. Of necessity, a major part of the work will consist of programs for child care, but it is highly important that persons of predraft age, as well as industrial workers, be included in this work.

To carry out this program will require concerted and patient work on the part of the dental profession. It will mean that many states will have to expand and others will have to improve their present dental programs.

Analyses of the programs of numerous states indicate that they lack directional planning and resourceful execution. The types of programs that are being conducted, the unexpended balances and other indications show that many state dental programs do not achieve the desired standard. Too many programs consist solely of routine examinations and educational activities of questionable effectiveness, with little or no provision for corrective work. In too many instances, educational efforts are directed toward school children who are not in a financial position to do anything about their dental condition.

The National Health Program Committee of the American Dental Association comments on the problem thus: "Organized dentistry in this country has the definite duty of expanding its usefulness to the public by diminishing the effects of dental disease upon the population. This can best be done by effective organization of the dental facilities of the state and community through the cooperation of governmental dental health officers and organized dentistry . . ."

Through state and federal collaboration, the dental problem can, I am confident, be handled effectively, but the responsibility for the development of adequate public health dental programs rests on the dental profession. From its ranks must come the leaders, the foresight and the initiative. Optimum dental health for a majority of the people will not be realized until the dental profession successfully meets this challenge.

BIBLIOGRAPHY

1. BRITTEN, R. H., and PERROTT, G. St. J.: Causes of Physical Disqualification Under Selective Service Law—Early Indications. *Pub. Health Rep.*, 56:4, May 9, 1941. (Reprint 2276.)

2. *Bull. U. S. Army M. Dept.*, April 1944, No. 75, p. 9.

3. KLEIN, HENRY, and PALMER, C. E.: Dental Problem of Elementary School Children. *Milbank Mem. Fund Quart.*, 16:276, 285, July 1938.

4. Committee on Community Dental Service of New York Tuberculosis and Health Association: Health Dentistry for Community, February 1935, p. 62.

5. COLLINS, S. D.: Frequency of Dental Services Among 9,000 Families, Based on Nation-Wide Periodic Canvasses, 1928-1931. *Pub. Health Rep.*, 54:13, April 21, 1939. (Reprint 2058.)

6. BRITTEN, R. H.: Study of Dental Care in Detroit, Michigan. *Pub. Health Rep.*, 53: 6, March 25, 1938. (Reprint 1919.)

7. WORKS, G. A., and MORGAN, BARTON: Land-Grant Colleges. Staff Study No. 10, 1939, pp. 5 and 13.

8. KRATZ, F. W.: Status of Full-Time Local Health Organizations at End of Fiscal Year 1941-1942. *Pub. Health Rep.*, 58:345, February 26, 1943.

9. CADY, F. C.; DEAN, H. T., and MESSMER, C. T.: Survey of Dental Activities of State Departments and Institutions of United States. Public Health Bull. No. 227, June 1938.

10. PELTON, W. J.: Dental Health Administration in United States. Unpublished data.

11. MOUNTIN, J. W., and FLOOK, EVELYN: Distribution of Health Services in Structure of State Government. Chapter VI: Medical and Dental Care by State Agencies. *Pub. Health Rep.*, 57:1235-1274, August 21, 1942. (Reprint 2395.)

HEALTH EDUCATORS VISIT THE A.D.A.

August 16, the American Dental Association was host to forty-six health education students from eighteen states and Canada. A full and concentrated program presented by the Central Office staff heads familiarized the students with the functions and activities of the Association.

The visit was arranged for by Mr. Derryberry, of the United States Public Health Service, under whose auspices the students were completing a twelve months' public health course at the University of Michigan, Yale University and the University of North Carolina. Their nine months of academic work was followed by three months of field work, several days of which were spent at the American Medical Association headquarters and one half day at the American Dental Association Central Office. After completing their course, the students will return to their positions in federal, state and local health departments.

The Association welcomed the opportunity of giving these key health specialists concrete information regarding our organization as each visitor will carry that knowledge back to her community, to the benefit of those for whom she works. It is hoped that these annual courses in health education, including at least a one day's visit to the American Dental Association headquarters, will be routine in the future.

The program that was presented by the department heads was as follows:

Health Educators Meeting, Wednesday afternoon, August 16, 1944, American Dental Association, 222 E. Superior St., Chicago, Ill., Harry B. Pinney, presiding.

Dr. H. B. Pinney, Secretary, American Dental Association: Greetings and Brief Outline of A.D.A. Organization and Activities.

Dr. Harold Hillenbrand, Assistant Editor, Journal A.D.A., substituting for Dr. H. H. Horner: Activities of Council on Dental Education.

Mrs. Josephine P. Hunt: Services of

Library Bureau for Health Educators.

Dr. L. Pierce Anthony, Editor, JOURNAL A.D.A.: A.D.A. Publications

Mr. G. H. Fox, Secretary, Committee on Legislation: Activities of Legislative Committee of Special Interest to Health Workers.

Mr. J. E. Bagdonas, Secretary, Committee on Economics: Activities of Committee on Economics of Special Interest to Health Workers.

Dr. D. A. Wallace, Secretary, Council on Dental Therapeutics: Council on Dental Therapeutics and Research Commission.

Dr. A. O. Gruebbel, Secretary, Council on Dental Health: Activities of Council on Dental Health.

Dr. Lon W. Morrey, Director, Bureau of Public Relations: Dental Health Educational Material for Health Workers.

Tour of the Central Office Building.

HORACE WELLS CENTENARY PROGRAM

THE Program Committee of the Wells Centenary is preparing the program of the meeting to be held in Hartford, Conn., December 11, 1944.

In addition to the two sections carried on simultaneously on the morning of December 11, there will be three or four speakers following the luncheon. The Surgeon General of the U. S. Public Health Service has accepted an invitation to speak at this time. It is planned to have about eight speakers at the morning session. Dr. Howard R. Raper has been invited to present a paper on the life of Horace Wells. Dr. Theodor Blum has accepted an invitation to prepare a paper on the history and use of local anesthesia.

Dr. E. A. Rovenstine, Professor of Anesthesia, New York University, College of Medicine, and Herbert Thoms, one of the editors of the *Connecticut State Medical Journal,* have been added to the Committee and are cooperating in the preparation of the program, which will represent a distinguished group of speakers.

ARTHUR H. MERRITT,
Chairman, Program Committee.

Hotel reservations can be made through Dr. T. Frank Cassidy, 750 Main St., Hartford, Conn., Chairman of Local Arrangement Committee, or directly with the Hotel Bond, Hartford, Conn.

EUGENE M. CLIFFORD,
Chairman, Horace Wells
Centenary Committee.

COUNCIL ON DENTAL THERAPEUTICS

PENICILLIN PROGRESS*

AUSTIN E. SMITH,† M.D., Chicago, Ill.

I PREVIOUSLY reviewed in THE JOURNAL the status of penicillin. Since that time, much more information has been accumulated on the status of penicillin chemotherapy, but its rôle in dentistry has yet to be completely defined. In fact, little work has been done on this score, although a few studies now being conducted will, when published, provide information on topics of special interest to the dentist. Nevertheless, a review of certain pertinent data suggests more strongly than ever that penicillin is on its way to becoming a very useful addition to the dentists' drug armamentarium. Other antibiotics are less promising. At best, most are only in the "test-tube" stage. None seem likely to replace penicillin in the near future, although tyrothricin has some value on local application and can be regarded as a useful adjunct. This drug is now included in New and Nonofficial Remedies.

Patulin, which has received some publicity, is being subjected, according to a report published in May, to clinical trials in industrial establishments and schools in England, but unless definite evidence of its value is established, production will not be encouraged, at least in England, on a large scale. At the same time, reports have appeared concerning its toxicity, and while it has been suggested for, among other things, "sterilizing" the urine in cases of long standing infections which have proved resistant to sulfonamides and other drugs, and for venereal infections, it has been said to have marked toxic properties.

Much newspaper publicity was given recently to a substance called "vivicillin," prepared from *Penicillium notatum*, the original report being released from England. According to the press, the substance merited glowing accounts of its efficacy, yet, in a letter to the editor in the June 3 issue of the *Lancet*, there appeared reports on twelve cases under the supervision of a specialist in pathology, an officer in the surgical division and an officer in a medical division of a military hospital in England, which concluded: "All streptococci, staphylococci and gonococci isolated from this series of cases were found to be penicillin sensitive. Penicillin was not available for our cases and we had hoped that vivicillin would prove an effective substitute. Our trial did not, however, demonstrate that vivicilllin had any bacteriostatic or therapeutic effect on the conditions we treated."

In due time, another report on penicillin and other antibiotics will appear under the sponsorship of the Council on Dental Therapeutics. Because of this fact, and because of the comparatively slight therapeutic progress that has been made with the other extracts, the present paper will be confined to penicillin.

GENERAL INFORMATION

Information released on penicillin is of varied interest. For example, because of inquiries regarding the price of penicillin now available to civilian hospitals, the Office of Price Administration recently stated that considerable variation in the maximum price exists at the present time. While one seller's price to civilian hospitals is, at the time of writing, $3.15 per hundred thousand Oxford units, other sellers are supplying the U. S. Government at a price much lower than this, and, according to the OPA, it is reasonable to expect further reductions in the price to civilian hospitals. During the last year, the actual selling prices

*The Council on Dental Therapeutics has authorized publication of this report as one of the series on pharmacology and therapeutics. The opinions expressed are those of the author and do not necessarily reflect the opinion of the Council.—DONALD A. WALLACE, *Secretary*.

†Secretary, Council on Pharmacy and Chemistry, American Medical Association.

1. SMITH, A. S.: Present Status of Penicillin. J.A.D.A., 31:790, June 1, 1944.

have declined considerably as production has become greater.

A news release issued through the facilities of the Office of War Information, June 15, 1944, reveals that the U. S. Public Health Service of the Federal Security Agency and a number of the state health departments are undertaking the large scale use of penicillin in the treatment of early syphilis. Selected patients with early syphilis will receive penicillin in rapid treatment centers, of which there are more than fifty in the United States. At the time of the release, thirty-six centers in eighteen states were said to be already participating in the penicillin program, which is for research as well as treatment. The use of penicillin in this program will be restricted to patients with untreated early syphilis, dark-field positive, and patients for whom six months' or a year's follow-up seems possible. Two schedules of therapy are being considered, a four-day schedule and an eight-day schedule. According to the medical director, about one-third of all syphilis patients admitted to rapid treatment centers are infected also with gonorrhea, and hope is held out that penicillin may be able to cure syphilis and gonorrhea in the same patient. If so, it would be the first time in medical history that patients with both these venereal diseases could be treated with a single drug.

Penicillin has even been tried in aerosol solutions. A report in the July issue of *Science* concerns the use of penicillin for such purposes, and the investigators concluded that penicillin used in a nebulizer forms an aerosol that may be recovered with no marked loss of activity and no change in chemical properties, and that penicillin aerosols penetrate the lungs and are diffused into the blood stream. Much work remains to be done in this field, and yet these investigators under proper conditions were able to recover 60 per cent of the aerosolized penicillin in the urine within twelve hours; which compares favorably with an average recovery of 60 per cent after intravenous injection.

An international penicillin reference standardization has been proposed, and it seems likely that an international conference to devise standards for penicillin to be recognized universally may be held in England very soon. Production in the United States is said to have expanded so that some of the needs of other countries can be met. In fact, from the June allocation, 1,000,000,000 units was exported to other American republics, the distribution and use to be restricted to those permitted in this country. At the same time, other countries are swinging into significant production. Recently, Sir Henry Dale, of England, set forth a summary of points to be considered before an international conference is held. Included are the question of dosage in milligrams instead of units when a pure substance becomes generally available, the allocation of penicillin for standardization, the definition of a permanent unit in terms of the adopted standard and the interchange of information about the formula of penicillin and progress toward its synthesis. The value of an international conference to devise universal standards is obvious, and the need for such standardization seems to be growing more urgent. If such a standard becomes available, the U. S. Pharmacopeia will probably recognize it.

The amount of work that is being done on penicillin becomes evident on examination of scientific publications. Work is being conducted on the effect of penicillin on bacterial infections other than those recognized as amenable to treatment, enhancing of its antibacterial action by the addition of other compounds, such as a sulfonamide, inhibition of the drug action by enzymes, effect on tissues and blood cells and other problems. In one experimental journal, the *Proceedings of the Society of Experimental Biology and Medicine*, June issue, may be found ten papers in this field. Few drugs have ever been the object of such exciting research.

AVAILABILITY

The Office of Civilian Penicillin Distribution of the War Production Board has made available a statement covering the uses and dosage of penicillin as a guide in use of the drug, which is now obtainable from "depot hospitals." At the time of writing, there are more than 2,000 such hospitals. They were selected by the Advisory Panel of the Office of Civilian Penicillin Distribution so that local depots might be set up for further distribution of penicillin. Such hospitals will recognize the requests of other hospitals and, if the need is estab-

lished, "will to the best of their ability in consideration of the supply on hand furnish penicillin for purchase by such other hospitals." Depot hospitals have been established in every state in the Union, and their locations may be obtained from the Office of Civilian Penicillin Distribution, 225 W. Jackson Blvd., Chicago 6, Ill.

The depot hospital will have a monthly quota, which may be purchased through the central office in Chicago. From this office, orders will be passed on to penicillin manufacturers according to the supply available, and the producer will ship penicillin to the hospital through the regular channels. Penicillin manufacturers cannot accept orders except as they come through such recognized offices. It may be that, within a few months, even this liberal control can be abolished, but, until such time, it will have to be continued to assure an available supply when needed in civilian practice.

Production is advancing rapidly in several allied countries. In England, the Penicillin Clinical Trials Committee appointed by the Medical Research Council is responsible for the distribution of penicillin allocated for research. The total quantity distributed by the committee up to the end of March 1944 was about 500,000,000 units. Apparently no proposal for any promising investigation had been rejected owing to shortage of supply. The War Department of the United States expects to spend $100,000,000 more for penicillin during the fiscal year which begins July 1 than it spent during the preceding year. According to a recent news release, the Army is now buying the material at $3 to $6 per hundred thousand units and expects an average price of $2 to $3 during the current year. Canada has a plant in which use of a bottle method will permit tripling its penicillin output. The plant begins operation about July 1. The total production will be needed, at least for several months, by the Army. The plant is government owned, but operated by a drug concern. Another plant, privately owned, will begin production later in the year; and possibly two more plants will be built in Eastern Ontario. The Connaught Laboratories of the University of Toronto have been, and still are, producing some penicillin.

The Banting Institute has been able to make available a limited quantity of penicillin under the auspices of the National Research Council for distribution for civilian use in the treatment of staphylococcic septicemia and staphylococcic meningitis. It seems very likely that larger quantities for civilian use will be available by the end of the year. According to the August issue of the *Canadian Medical Association Journal*, the Department of Munitions and Supply has announced that public general hospitals of more than twenty-five beds may purchase penicillin on a quota basis for restricted civilian use through the Office of the Controller of Chemicals. Smaller hospitals may receive supplies by appealing to the controller, who will act on the advice of a medical advisory committee. This advisory committee on penicillin has issued a guide for penicillin treatment, the guide being somewhat similar in context to that released through the U. S. Office of Civilian Penicillin Distribution.

It has been reported that more than 10,000,000 units daily will be produced in Mexico beginning in August. Some penicillin has been bought from the United States (3,500,000,000 units for $140,000) by the Mexico Department of Public Health. This will be sold and the price will be from $30 to $40 per hundred thousand units, instead of $90, the former price. Five laboratories are now engaged in producing penicillin.

Even cheese producers have some part to play in the penicillin program. Ontario cheese producers are sending 250,000 pounds of whey each day to the United States penicillin plants.

Pharmaceutic houses, jointly with radio and electrical research laboratories, have developed remarkably quick drying devices for penicillin solutions. One system is said to remove within thirty minutes as much water as the older vacuum-freeze drying method removed in twenty-four hours. Another development concerns a high vacuum diffusion process which permits drying the concentrated solution while frozen. One of the devices, so it is claimed, dries concentrated solutions containing 2,000,000,000 Oxford units within twenty-four hours. This corresponds to about 20,000 ampuls each containing 100,000 units, an amount sufficient to treat several thousand patients.

THERAPEUTIC STATUS

Penicillin is claimed to be effective in staphylococcic infections with or without bacteremia, clostridial infections, hemolytic streptococcic infections with bacteremia and and all serious local infections, anaerobic streptococcic infections, pneumococcic infections, sulfonamide-resistant pneumococcic pneumonia, complicated gonococcic infections, sulfonamide resistant gonorrhea and meningococcic infections not responding to sulfonamide therapy.

Penicillin is said to be of uncertain value in infections of the peritoneum and liver in which the predominating organism is of the gram-negative flora; e.g., ruptured appendix and liver abscesses and ratbite fever due to *Streptobacillus moniliformis*. Penicillin is an effective agent in syphilis, actinomycosis and bacterial endocarditis, but its position remains to be more definitely defined.

The drug has not been established as effective for gram-negative bacillary infections, tuberculosis, toxoplasmosis, histoplasmosis, acute rheumatic fever, lupus erythematosis disseminatus, infectious mononucleosis, pemphigus, Hodgkin's disease, acute and chronic leukemia, ulcerative colitis, coccidioidomycosis, malaria, poliomyelitis, blastomycosis, non-specific iritis and uveitis and moniliasis.

The method of preparing penicillin for treatment, administration and dosage have been previously discussed in THE JOURNAL.[1] As a brief summary, the recommendations recently published by the Council on Pharmacy and Chemistry[2] are presented:

Preparation of Penicillin for Treatment.—Penicillin is supplied in ampuls of different sizes, 25,000 units and 100,000 units each. Being extremely soluble, penicillin can be dissolved in small amounts of sterile distilled, pyrogen-free water or in sterile isotonic solution of sodium chloride. When large unit sizes are being used in hospitals, the contents of the ampul should be dissolved in water or saline solution so that the final concentration is 5,000 units per cubic centimeter. This solution should be stored under aseptic precautions in the icebox and made up fresh every day. Solutions for local or parenteral use may be diluted further in accordance with the concentration desired.

Intravenous injection: 1. The dry powder may be dissolved in a sterile isotonic solution of sodium chloride in concentrations of 1,000 to 5,000 units per cubic centimeter for direct injection through a syringe. 2. The dry powder may be dissolved in a sterile saline or 5 per cent dextrose solution in lower dilution (25 to 50 units per cubic centimeter) for constant intravenous therapy.

Intramuscular injection: The total volume of individual injections should be small; i.e., 5,000 units per cubic centimeter of isotonic saline solution.

Topical application: 1. The powdered form of the sodium salt is irritating to wound surfaces and should not be used. 2. Solutions in isotonic salt solution with a concentration of 250 units per cubic centimeter are satisfactory. For resistant or more intense infections, this concentration may be increased to 500 units per cubic centimeter.

Dosage.—The dosage of penicillin will vary from one patient to another, depending on the type and severity of the infection. In many serious infections, recovery has followed administration of 40,000 to 50,000 Oxford units a day. In others, 100,000 to 120,000 or even more is necessary. The objective in every case is to bring the infection under control as quickly as possible. It is well to remember that penicillin is excreted rapidly in the urine, so that, after a single injection, it is often impossible to detect it in the blood for a period longer than two to four hours. It is well, therefore, to use repeated intramuscular or intravenous injections every three or four hours or to administer it as a continuous infusion.

In the treatment of meningitis, empyema and surface burns of limited extent, penicillin should be injected directly into the subarachnoid space or the pleural cavity, or applied locally in a solution containing 250 units per cubic centimeter.

The toxicity of penicillin is low as was indicated in an earlier paper.[1] However, an interesting observation is the relative toxicity of penicillin salts, which has been investigated and reported on by a group at the Food and Drug Administration laboratories. Sodium, ammonium, strontium, potassium and magnesium salts were prepared from a single waste lot of penicillin, while the calcium salt was prepared from a commercial preparation. Arranged according to

2. *J.A.M.A.*, 125:707, July 8, 1944.

relative toxicity, the salts were, in increasing order: sodium, ammonium, strontium, calcium, magnesium and potassium. This was based on milliequivalents of the cation used in the preparation of these salts. It was concluded that the toxicity of salts of penicillin is primarily due to the cations used in their preparation.

At least one case of dermatitis from contact with penicillin has been reported, occurring in a medical officer in a military hospital who was charged with the preparation and administration of penicillin solutions. He developed a marginal blepharitis, conjunctivitis and some blurring of vision on reading. A dermatitis appeared across the bridge of the nose and spread over the forehead and face. Tests revealed sensitivity to penicillin. In the same center, three hospital corpsmen experienced slight discomfort from itching of the face and penis, though they gave no evidence of dermatitis.

Another recent interesting observation in the *Journal of the American Medical Association* concerns the stability of penicillin solutions. Earlier specimens of penicillin were unstable and had to be stored at below 5°C. One group of investigators subjected preparations of the sodium salt of penicillin of eight manufacturers to dilution with isotonic solution of sodium chloride. Each lot was divided into three portions, one being kept at room temperature, one in the incubator at 37°C. and one in the refrigerator at 2°C. Daily estimations of activity were made with no evidence of deterioration of any preparation at room temperature during the first seven days. The activity then declined, although the solutions were still active for some weeks, and in a few cases several months. In the incubator, no deterioration was detected before the fourth day, but thereafter it was rapid. Such findings appear important for those who use a constant intravenous drip when several or many hours' supply is made up at one time. They are also pertinent for those who have no facilities for adequate storage.

There is still considerable discussion concerning the use of a crude penicillin filtrate for local treatment, but, in view of evidence presented elsewhere, and the fact that refined penicillin preparations are now becoming increasingly available, the use of crude penicillin seems of only historical interest. A paper presented in a May issue of the *British Medical Journal* discusses the local use of an untreated filtrate in twenty-four patients. The filtrate was applied to superficial lesions by gauze soaked in it, by a cream or by portions of the recently grown mold after the fluid medium had been drained away. The cases included osteomyelitis, discharging sinuses, non-healing wounds, syphilitic ulceration, gonococcic vulvovaginitis and abscesses. In nineteen of twenty-four cases, the filtrate provided some success, and the author suggested further trial with crude penicillin filtrate which contained 4 to 10 units of penicillin per cubic centimeter.

HIGHLIGHTS OF SOME INTERESTING REPORTS

Because of the scarcity of penicillin, much originality has been shown in its use For example, one investigator who was interested in the treatment of chronic gonorrhea made use of the knowledge that 50 per cent or more of injected penicillin is excreted unchanged in the urine and that the drug is absorbed from the duodenum. He chose four cases of gonorrhea that had received previous treatment with the sulfonamides and other forms of therapy without much success, and placed tubes in the duodenum of the patients, the position being checked with a fluoroscope and x-rays at regular intervals. Urine collected from a patient who had been receiving penicillin intravenously or intramuscularly was injected down the tubes at three-hour intervals for periods of thirty to thirty-six hours (the urine had no special preparation other than passage through a Seitz filter and storage at 42° F.). The amount of penicillin administered was calculated on the amount of urine administered. Each patient was believed to have received from 150,000 to 180,000 units of penicillin. The urine from the gonorrheal treated cases had a marked bacteriostatic effect on organisms *in vitro,* and all patients demonstrated a marked decrease in the amount of urethral discharge within twelve hours. While waiting for the report to be published, the investigator treated sixteen more patients by this technic, but, by the time his paper was published, it was no longer used, as a sufficient supply of penicillin had become available. The author states that of the twenty cases treated, fifteen could

be considered successful and five were failures.

At the June 1944 meeting of the American Medical Association, penicillin had an important rôle in the presentation of papers and discussions. The program of the scientific assembly contained twelve papers on penicillin, a panel discussion in conjunction with a discussion of the sulfonamides, a panel on penicillin in syphilis and a symposium on the use of the drug on the eye, ear, nose and throat. Much of the program seemed to support facts already known; some of it provoked contemplation of further uses. One investigator reported a series of Army-initiated studies in fifteen selected hospitals on groups of gonorrhea-infected patients refractory to at least two courses of a sulfonamide, and, in some cases, to fever, who were treated with trial dosages of penicillin sodium varying from 40,000 to 160,000 Oxford units per case. The individual dose was 10,000 to 20,000 units given intramuscularly every three hours. Studies indicated penicillin to be very effective. One course of treatment effected cures in 98 per cent of cases receiving a dosage of 160,000 units; 96 per cent in the 80,000 to 120,000 unit bracket, and 86 per cent of those receiving 50,000 units. Ninety-two per cent of the penicillin failures were cured by retreatment with a second course. Most of the complications of gonorrhea responded well. Reactions to treatment were inconsequential.

Penicillin was also reported to be of value in acute and chronic otitis media, acute mastoiditis and acute labyrinth otitis. It was frequently employed with success when other forms of therapy had failed. Sometimes, it was possible to avoid surgical measures for acute mastoiditis and, at other times, the drug was used with satisfactory results after operation. When penicillin was instilled in the mastoid cavity after operation, healing was prompt and the period of convalescence was shortened. Penicillin was claimed to be the most powerful chemotherapeutic agent available to combat acute otitis media and acute mastoiditis and the complications of these diseases.

At another center, penicillin was used in some of the more severe and life-endangering infections of the nose and throat. These included orbital complications of paranasal sinus disease, osteomyelitis of the front and maxillary bones, epidermal abscess, brain abscesses and cavernous sinus thrombosis. Penicillin therapy effected prompt improvement and, in some cases, had spectacular results. In general, the acute infections responded more quickly and satisfactorily than the chronic ones. The drug was not sufficient in the majority of cases treated to effect a permanent cure, and it was usually necessary also to employ adequate surgical measures. The dosage used was large and no reactions were noted.

Another report concerned the administration of penicillin intrathecally (10,000 units every twenty-four hours) and intravenously or intramuscularly (10,000 to 15,000 units every three hours) in a series of sixty-three patients with cerebral spinal fever, three with hemolytic streptococcus meningitis, two with *Streptococcus viridans* meningitis with bacteremia and one with pneumococcic meningitis secondary to acute otitis media. Use of the drug had a rapid clinical and bacteriologic response, with recovery in sixty-eight of the sixty-nine patients. The one who died was moribund on admission.

The use of penicillin in the treatment of peritonitis produced experimentally revealed that large doses of the drug were needed, and it was suggested that such treatment should be used only in those areas where surgical measures are not available.

In the panel discussion of penicillin in the treatment of syphilis, three papers were presented. One group of three men reported work on a group of four patients one year after treatment with penicillin for early syphilis. Studies on 100 additional patients were also reported. Another report revealed preliminary results of treatment of about 1,000 patients with early syphilis given penicillin by several different treatment schemes in the U. S. Army, U. S. Navy and civilian research centers. Another paper concerned 200 patients treated with penicillin for late syphilis who had received from 1,200,000 units to more than 4,000,000 units intramuscularly in eight days. In neurosyphilis, including simple dementia paralytica, there was a pronounced symptomatic and serologic response. Gumma responded quickly. Variable degrees of degeneration and scar in tabes interstitial keratitis were affected, the response being in proportion of the preponderance of the ac-

tive processes. Pregnant women with early syphilis responded clinically and serologically and the fetus seemed normally protected. Aggregate results were at least equal to usual expectations. No significant toxic reactions were encountered.

Another report was presented on the use of penicillin in more than 400 patients with genital urinary tract infections other than syphilis, including specific urethritis, non-specific urethritis, prostatitis, seminal vesiculitis, epididymitis, cystitis and pyelitis.

A series of 450 sulfonamide-resistant cases divided into several groups and treated by several technics with penicillin were discussed. Group I included 105 cases treated with 160,000 units, 10,000 units being injected intramuscularly every three hours. In this group were two failures. Group II included 112 cases treated with 100,000 units, 10,000 units being injected intramuscularly every hour. In this group were eleven failures. In Group III, 233 cases were injected, each receiving a total of 50,000 units, 10,000 units being given intramuscularly every three hours. Here, there were fifty-five primary failures. Forty-seven of the fifty-five failures were successfully retreated with 100,000 units. The highest incidence of positive and doubtful smears was found to occur seven to fourteen days after treatment. Temporary gonococcus bacteriostasis was evident for seven days after treatment. Only 2 per cent of posttreatment cultures were positive. Mild to moderate complications apparently do not act against penicillin success. The most frequent complication was acute prostatitis. All patients tolerated the treatment well and, on retreatment, penicillin sensitivity was not observed. Eventual success was obtained in the penicillin failures, four clearing up with hyperpyrexia and administration of 100,000 units of penicillin, three with 1,000,000 units of penicillin and seven with a sulfonamide and local treatments.

Several papers have been published recently on the use of penicillin in the eye. One group of investigators found that penicillin can be detected in the eyeball within fifteen minutes after a large intravenous injection, the following showing concentrations in decreasing order: extra-ocular muscles, sclera, conjunctiva, tears, chorioretinal area, aqueous humor, vitreous humor and cornea. There was none in the crystalline lens. In therapeutic doses, the amount present was not detectable by the usual methods. After subconjunctival injections, high concentrations were reached in the cornea, iris, ciliary body, conjunctiva and sclera and a moderate amount in the aqueous and vitreous humors. A constant corneal bath with penicillin gave somewhat similar results.

Eight cases of ophthalmia neonatorum treated with intramuscular injections of penicillin in total doses varying from 60,000 to 330,000 units have been reported. Six cases responded promptly with complete recovery within three to six days, marked clinical improvement showing within twenty-four hours. The disappearance of specific organisms in smears and cultures was noted within nine to twenty-four hours after beginning treatment.

Another interesting statement supplied findings in twenty-one patients, aged 21 to 49 years, having gonorrhea infections. Eight had had earlier infections. The length of the disease varied from five days to four months. Some had received sulfonamides and local therapy and induced fever, but none of these technics seemed to make any difference in their response to penicillin. The patients were given intramuscular (gluteal muscle) injections, the total dosage varying from 50,000 to 100,000 units. With one exception (a severe acute hemorrhagic urethritis), every infection gave a prompt response to treatment, even within two or three hours. The urethral exudate changed and, within five or six hours, had almost disappeared. No discharge was apparent the following morning. At the same time, relief from subjective symptoms was experienced. The authors made an attempt to determine the possible curative effects of instillation of penicillin locally and found that neither cultures nor smears became negative at any time. They felt that penicillin applied locally was not capable of eradicating gonorrheal infection from the interior urethra. Follow-ups, even after bouts of excessive drinking, revealed no gonococci by smear or culture. Two cases of reinfection also responded to treatment. Two interesting points elicited by these investigators were: Ambulatory patients were treated and responded satisfactorily so that hospitalization was not necessary. Dosage was spread over only a few hours, not one or two

days, and continuous intravenous injection was not employed.

Another report points out the dramatic response that may follow penicillin therapy and the value of supplemental therapy. This report concerned a case of staphylococcic septicemia arising from a uterine focus with peritonitis, toxic hepatitis, bilateral bronchopneumonia, acute glomerular nephritis, toxic myocarditis, left pleural effusion and pericarditis with effusion. The patient responded to penicillin, but not to the sulfonamides, but at the same time, received supportive measures including injection of plasma, blood, dextrose and saline; administration of oxygen; thoracentesis; liver and iron therapy and a good diet.

Of eight reports to the British Medical Research Council of an investigation of the therapeutic properties of penicillin, published in an April issue of the *British Medical Journal* (England has a medical research council and its Penicillin Clinical Trials Committee, which was established in March 1943, allocates supplies of penicillin for therapeutic study), one stresses the marked antibacterial properties of penicillin, even in high dilutions, its ability to act in many media which inhibit other anti-infective agents, even body fluids such as serum, blood and pus, and its relative non-toxicity to the body and its cells. The first report, which serves as an introduction, also lists the organisms against which penicillin is most effective, and stresses the important fact that surgical measures and other supportive treatment should not be abandoned even though penicillin is available, nor should other drugs be abandoned if indicated, as penicillin may produce bacteriologic blood "cures" without effecting a cure for the patient.

One of the statements reports the use of penicillin applied locally to the eye in iritis in a patient with gonorrheal iridocyclitis, which gave results suggesting that penicillin may diffuse through the cornea in amounts of therapeutic value. The report states that conjunctivitis cases also responded. Another presentation concerned instillation in chronic otitis media, which was found to cause the disappearance of penicillin-sensitive organisms, with apparent clinical improvement; but relapses occurred within a day or two after cessation of treatment. In two cases of staphylococcic septicemia with multiple abscesses, adequate bacteriostasis in the blood was maintained by the daily administration of approximately 120,000 units, the blood cultures remaining negative. One patient received 2,000,000 units, the other 3,000,000 units, but both died. On postmortem examination, they were found to have multiple abscesses containing living staphylococci. A third patient with similar conditions was "drained" and penicillin solution administered locally as well as by injection. This patient made a complete recovery. Thus, penicillin therapy is shown not to replace surgical drainage.

Another patient who had received penicillin directly in the marrow of the tibia died. Postmortem examination showed no damage to the marrow at the site of injection. One patient died of an infection introduced by the intravenous drip. Another, a meningitis patient, was cured of an infection, but has remained semicomatose, the condition indicating permanent damage to the brain. Thus, penicillin cannot correct the damage already done, at least in such cases. Some victims developed thrombophlebitis on an average after about 100 hours of injection. The authors regard thrombophlebitis as an indication for stopping transfusion. Local abscesses formed around the site of the needle in two cases.

Renal functional impairment may lead to less excretion of penicillin and an adequate concentration with smaller than expected doses. This important point was brought out in the symposium. A more recent report in *Science* concerns the use of a drug to deliberately delay the excretion of penicillin. The use of such practice is worthy of further trial and may provide a means of conserving penicillin supplies and lessening inconvenience for the patient when penicillin is administered parenterally.

Various methods of administration are compared in the symposium, and the authors comment on continuous intravenous drip, intermittent intramuscular injection, continuous intramuscular injection and bone marrow drip. The advantages of the continuous intravenous drip are said to include the obtaining of a continuous blood titer, and the fact that other materials can be introduced. (I question the advisability of simultaneous administration of other drugs until more is learned about the incompatibilities of penicil-

lin.) Its disadvantages include the possibility of thrombophlebitis and the fact that veins may be rendered useless for further injection. While intermittent intra-muscular injection is simple, it is painful, disturbs the patient and produces a fluctuating titer. The continuous intramuscular injection lessens pain, provides a more nearly uniform titer and permits the use of numerous sites for injection. Unfortunately, large amounts cause leakage, and abscesses may form at the site of the needle. With the bone marrow drip, it was found difficult to run more than one pint to the sternum, although the technic may be of some value in infants. Examination of the marrow showed no changes that could be attributed to the use of penicillin.

One of the presentations that would be of special interest to members of the dental profession concerns the treatment of mandibular infection. A soldier with a two months' old sinus in the iliac crest was given penicillin, but operation was finally necessary. A sequestrum was found in a cavity lined by fibrous tissue; which suggests that even if apparent sterility is obtained, healing may not occur if fibrosis and avascularity are present. This, of course, is true of many bone infections. A series of four infected patients successfully treated with penicillin included one on whom resection of the left side of the mandible from the canine tooth to the temporomandibular joint was performed for an infected multilocular cyst, two bone graft cases, one with a sinus into the mouth and one in which the right side of the mandible had been resected for odontoma.

Rainford Mowlen, M.D., F.R.C.S., in his report of sixteen cases of osteomyelitis of the mandible, suggested that the condition may arise from blood-borne infection or may follow tooth extraction. After discussing the mechanism of infection, he states that the problem of treatment is to remove the devitalized and thrombosed and infected medullary bone, and to eliminate that part of the dense cortical bone which cannot resist the spreading infection. He suggests leaving behind only those areas having an adequate blood supply so that they may be able to deal with residual organisms and later generate new bone. An operation that was suggested consisted of the subperiosteal excision of the lower borders of the bone, together with the outer plate and all the infected medullary area. Commenting on the argument that exposure of the uninfected bone by such a clearance would result in further osteomyelitis, the surgeon said that this is not the case in such virulent infection as is encountered in acute mastoiditis, and does not seem to occur in the mandible if only vascular bone is left behind. He further states that until the advent of penicillin, the overlying soft tissues of the cheek were packed away from the bone and the cavity allowed to granulate from its depth. Apparently, he had successful experience with the sulfonamide group so far as control of infection was concerned, but packing still seemed necessary. When penicillin became available, it was decided to continue this radical surgery with closure of the soft tissues, which is claimed to have several advantages. The investigator also sent bacteriologic swabs taken from the center of the infected area during operation for culture and penicillin sensitivity tests. Two small bore tubes were then inserted through separate stab wounds, one to run along the upper body of the residual bone and the other along the lower edge. He closed the wound of access without draining even though it extended through an abscess cavity. When the bacteriologic report became available, penicillin treatment was begun. The usual dosage was about 1,000 units in 1 cc. into each tube every twenty-four hours. Immediately before injection, the cavity was aspirated through the penicillin tubes and any resultant fluid sent for bacteriologic investigation and penicillin inhibition test. Treatment was continued until the wound had healed, on the average about ten days. Complications observed were continuation of soft tissue breakdown, formation of pus, persistence of discharge, section of the mandibular continuity and the presence of a large cavity, which needed packing.

Another report in the symposium offered information on the treatment of acute hematogenous osteomyelitis. Penicillin therapy permitted healing within one and one-half months in four of six cases. The authors compared this finding with a report in 1943 of an individual who treated seventeen patients with sulfathiazole and bone drilling, by which the duration of the disease was re-

duced by 60 per cent, but the average was still six months.

In the local treatment of hematogenous osteomyelitis and osteomyelitis after compound fractures, it was found that local application proved disappointing, perhaps for three reasons: failure of continuous application, inaccessibility of bone infection and presence of dead bone. In a miscellaneous group of postoperative wound infections, sinuses, etc., the majority responded well to local treatment.

Another group of patients with soft tissue lesions received penicillin by local application. In infected skin lesions, such as infected eczema and impetigo, a cream containing 400 units of penicillin per gram was applied, with healing in ten to fourteen days, although there were some relapses later if the lesions were closed. For abscess cavities, injection of penicillin into the cavities was sometimes satisfactory if application was thorough. In the treatment of acute, spreading cellulitis under skin flaps, the use of penicillin halted the progress of infection and resolution was rapid. Under tubed pedicle grafts, the results were not quite so marked. In the treatment of superficial wounds with skin loss, penicillin was found to be capable of sterilizing a wound and preventing its reinfection with sensitive organisms, but it did not necessarily follow that a wound thus sterilized would heal: If infection recurred, it was found advisable to test the new invader for sensitivity. It was concluded that penicillin therapy is a useful adjunct to surgical measures, but does not replace them. It was also found that penicillin may be of some value on local application to breast abscesses.

Concerning the treatment of seventy-five cases of skin disease, it was stated that penicillin "cures" an initial sycosis barbae, but does not prevent relapse. Perhaps it might prevent infection if applied prophylactically. In several cases of impetigo, penicillin cured eleven out of twelve victims in eight to nine days, while individual lesions healed within four days. Some of the cases were primary, others secondary, to scabies. Penicillin was also said to be of some value in eczema; of encouraging value in blepharitis, although relapse was frequent; of some effect in cases of otitis externa, although early relapses were appreciable, which was to be expected because of the mixed organisms; of no value when applied externally to the individual boil; of uncertain value in acne unless the staphylococcus was the contaminating organism, and not encouraging in miscellaneous cases such as seborrheic dermatitis, psoriasis, pemphigus vulgaris and chronic ulceration.

The use of penicillin involves much laboratory control. Sometimes, the laboratory prepares the solutions and cooperates by making bacteriologic diagnosis and determining whether the organism is sensitive to penicillin. It then follows the results of treatment by making further examinations of bacteria, penicillin content of exudates, etc. Sometimes, it is found that organisms are resistant to penicillin, or acquire resistance during treatment. Further, penicillin should be stored in a refrigerator, and each patient should have his own preparation to prevent cross-infection. Laurence P. Garrod, M.D., F.R.C.P., in his report on the laboratory control of penicillin treatment in the April symposium, stated that the great majority of the bacterial species found in the mouth are penicillin sensitive, unlike the bowel, where the prevalence is of the resistant species. The only organisms found markedly resistant were *Monilia albicans* and an occasional Neisseria and Hemophilus. Some organisms produce a penicillinase and thus may destroy the penicillin action.

Another report bearing close relation to dentistry appeared in a January issue of the *Journal of the American Medical Association,* dealing with the use of penicillin and heparin in the treatment of subacute bacterial endocarditis. For three days before removal of teeth, 10,000 units of penicillin were given intramuscularly every three hours, and the operative site was packed with gauze dipped in 5 cc. of a saline solution containing 20,000 units of penicillin. A similar routine was followed for tonsillectomy, and in no case was there an exacerbation of the infection.

SUMMARY

The need for further studies on the use of penicillin in dentistry is apparent. Its possibilities in the control of local tissue infections and more deeply seated pathologic processes, such as bone infections, remains to be determined. Unquestionably, penicillin has considerable lethal effect on many organisms

in the mouth. However, the effect of the drug when applied locally is modified by several conditions, and, when penicillin becomes more freely available, cognizance will have to be taken of each condition. How much penicillin will be used by the dentist will depend on how much of his practice is surgical. He may have reason to use or propose the use of penicillin by injection and can expect considerable therapeutic help provided indicated surgical measures are also undertaken. The local use of penicillin undoubtedly will give less dramatic results than parenteral injection, but it may have a place in the local treatment of infection, and perhaps even in the prevention of infection. In its use as a preventive, from what can be gained from present studies, there is not so much possibility of local damage to the tissues as with the sulfonamides. Until such time as current studies are completed and more penicillin becomes available for unrestricted use, the drug can be regarded only as a potentially useful agent in dental therapy. However, even with the present knowledge, it is evident that members of the dental profession have one more agent to meet some of the more serious problems that arise in dentistry. Even this fact holds forth much hope for the future.

COMMITTEE ON LEGISLATION

SERVICEMEN'S READJUSTMENT ACT OF 1944

THE Servicemen's Readjustment Act of 1944, commonly known as the G.I. Bill or the G.I. Bill of Rights, was approved by the President June 22, 1944. The law provides for the hospitalization of veterans; the education of veterans; loans for the purchase of homes, farms and business property; the employment of veterans, and readjustment allowances for veterans who are unemployed. At the present time, the dental profession is especially interested in Title II, which sets up a program for the education of honorably discharged veterans. A program for the vocational rehabilitation of honorably discharged veterans had previously been established under a law approved March 24, 1943. Any veteran who is eligible for the benefits under both laws may elect which benefits he desires.

The benefits contained in the "Vocational Rehabilitation Act," approved March 24, 1943, and officially known as Public Law 16—78th Congress, are limited to honorably discharged veterans who have an injury or disability which was incurred or aggravated by active military or naval service, and for which a pension is payable under laws administered by the Veterans Administration. Title II of the "Servicemen's Readjustment Act of 1944," however, provides education at Government expense for honorably discharged veterans who come within three general classifications: (1) those who had their education or training impeded, delayed, interrupted or interfered with by reason of their entrance into the service; (2) those who wish to take a refresher or retraining course and thereby obtain knowledge of any new scientific advances that have been developed while they were in the service, and (3) those who have served ninety days or more or who have been discharged or released by reason of an injury or disability incurred while in the service.

Title II, generally speaking, provides that the Administrator of Veterans' Affairs *shall* pay to the school the tuition, laboratory, library, health, infirmary and other similar fees; and *may* pay for books, supplies and equipment and other necessary expense, exclusive of board,

lodging, other living expense and travel; subject to a limitation of $500 for an ordinary school year. The Government will pay each eligible veteran pursuing a course of study a subsistence allowance of $50 per month, if without dependents, or $75 per month if with dependents. Lesser sums will be paid to those attending a course on a part-time basis. The law also provides that any books, supplies or equipment furnished a student under either Title II or the "Vocational Rehabilitation Act'" shall be deemed released to the student, unless he shall fail, because of fault on his part, to complete his course of study.

There is a provision that any one who was not over 25 years of age at the time that he entered the service is deemed automatically to have had his education interfered with. There are two limitations on the right to an education: (1) that the course must be started not later than two years after the date of discharge or termination of the present war, whichever is later, and (2) that the course shall not extend beyond seven years after the termination of the present war.

The law further provides that every one entitled to an education shall have the right to at least one year of study unless he shall choose a course that can be completed in less time. Each eligible veteran may select any course or any school that he wishes, whether or not the school is located in the state in which he resides, and further he may change his course for reasons satisfactory to the Administrator of Veterans' Affairs.

While the law does not specifically mention professional graduate or postgraduate courses, the Committee on Legislation has been informed that graduate or postgraduate courses will be considered to be the same as refresher or retraining courses.

Title II of the "Servicemen's Readjustment Act of 1944" and the "Vocational Rehabilitation Act" are both printed in full on the following pages of this issue of THE JOURNAL.

GEORGE H. FOX, *Secretary*
and Legal Advisor
Committee on Legislation

Public Law 346—78th Congress
Chapter 268—2d Session
S. 1767
AN ACT

To provide Federal Government aid for the readjustment in civilian life of returning World War II veterans.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that this Act may be cited as the "Servicemen's Readjustment Act of 1944."

[Title I omitted.]

TITLE II

CHAPTER IV—EDUCATION OF VETERANS

SEC. 400. (a) Subsection (f) of section 1, title I, Public Law Numbered 2, Seventy-third Congress, added by the Act of March 24, 1943 (Public Law Numbered 16, Seventy-eighth Congress), is hereby amended to read as follows:

"(f) Any person who served in the active military or naval forces on or after September 16, 1940, and prior to the termination of hostilities in the present war, shall be entitled to vocational rehabilitation subject to the provisions and limitations of Veterans Regulation Numbered 1 (a), as amended, part VII, or to education or training subject to the provisions and limitations of part VIII."

(b) Veterans Regulation Numbered 1 (a), is hereby amended by adding a new part VIII as follows:

"Part VIII

"1. Any person who served in the active military or naval service on or after September 16, 1940, and prior to the termination of the present war, and who shall have been discharged or released therefrom under conditions other than dishonorable, and whose education or training was impeded, delayed, interrupted, or interfered with by reason of his entrance into the service, or who desires a refresher or retraining course, and who either shall have served ninety

days or more, exclusive of any period he was assigned for a course of education or training under the Army specialized training program or the Navy college training program, which course was a continuation of his civilian course and was pursued to completion, or as a cadet or midshipman at one of the service academies, or shall have been discharged or released from active service by reason of an actual service-incurred injury or disability, shall be eligible for and entitled to receive education or training under this part: *Provided,* That such course shall be initiated not later than two years after either the date of his discharge or the termination of the present war, whichever is the later: *Provided further,* That no such education or training shall be afforded beyond seven years after the termination of the present war: *And provided further,* That any such person who was not over 25 years of age at the time he entered the service shall be deemed to have had his education or training impeded, delayed, interrupted, or interfered with.

"2. Any such eligible person shall be entitled to education or training, or a refresher or retraining course, at an approved educational or training institution, for a period of one year (or the equivalent thereof in continuous part-time study), or for such lesser time as may be required for the course of instruction chosen by him. Upon satisfactory completion of such course of education or training, according to the regularly prescribed standards and practices of the institutions, except a refresher or retraining course, such person shall be entitled to an additional period or periods of education or training, not to exceed the time such person was in the active service on or after September 16, 1940, and before the termination of the war, exclusive of any period he was assigned for a course of education or training under the Army specialized training program or the Navy college training program, which course was a continuation of his civilian course and was pursued to completion, or as a cadet or midshipman at one of the service academies, but in no event shall the total period of education or training exceed four years: *Provided,* That his work continues to be satisfactory throughout the period, according to the regularly prescribed standards and practices of the institution: *Provided, however,* That wherever the additional period of instruction ends during a quarter or semester and after a major part of such quarter or semester has expired, such period of instruction shall be extended to the termination of such unexpired quarter or semester.

"3. Such person shall be eligible for and entitled to such course of education or training as he may elect, and at any approved educational or training institution at which he chooses to enroll, whether or not located in the State in which he resides, which will accept or retain him as a student or trainee in any field or branch of knowledge which such institution finds him qualified to undertake or pursue: *Provided,* That, for reasons satisfactory to the Administrator, he may change a course of instruction: *And provided further,* That any such course of education or training may be discontinued at any time, if it is found by the Administrator that, according to the regularly prescribed standards and practices of the institution, the conduct or progress of such person is unsatisfactory.

"4. From time to time the Administrator shall secure from the appropriate agency of each State a list of the educational and training institutions (including industrial establishments), within such jurisdiction, which are qualified and equipped to furnish education or training (including apprenticeship and refresher or retraining training), which institutions, together with such additional ones as may be recognized and approved by the Administrator, shall be deemed qualified and approved to furnish education or training to such persons as shall enroll under this part: *Provided,* That wherever there are established State apprenticeship agencies expressly charged by State laws to administer apprentice training, whenever possible, the Administrator shall utilize such existing facilities and services in training on the job when such training is of one year's duration or more.

"5. The Administrator shall pay to the educational or training institution, for each person enrolled in full time or part time course of education or training, the customary cost of tuition, and such laboratory, library, health, infirmary, and other similar fees as are customarily charged, and may pay for books, supplies, equipment, and other

necessary expenses, exclusive of board, lodging, other living expenses, and travel, as are generally required for the successful pursuit and completion of the course by other students in the institution: *Provided,* That in no event shall such payments, with respect to any person, exceed $500 for an ordinary school year: *Provided further,* That no payments shall be made to institutions, business or other establishments furnishing apprentice training on the job: *And provided further,* That if any such institution has no established tuition fee, or if its established tuition fee shall be found by the Administrator to be inadequate compensation to such institution for furnishing such education or training, he is authorized to provide for the payment, with respect to any such person, of such fair and reasonable compensation as will not exceed $500 for an ordinary school year.

"6. While enrolled in and pursuing a course under this part, such person, upon application to the Administrator, shall be paid a subsistence allowance of $50 per month, if without a dependent or dependents, or $75 per month, if he has a dependent or dependents, including regular holidays and leave not exceeding thirty days in a calendar year. Such person attending a course on a part-time basis, and such person receiving compensation for productive labor performed as part of their apprentice or other training on the job at institutions, business or other establishments, shall be entitled to receive such lesser sums, if any, as subsistence or dependency allowances, as may be determined by the Administrator: *Provided,* That any such person eligible under this part, and within the limitations thereof, may pursue such full time or part-time course or courses as he may elect, without subsistence allowance.

"7. Any such person eligible for the benefits of this part, who is also eligible for the benefit of part VII, may elect which benefit he desires: *Provided,* That, in the event of such election, subsistence allowance hereunder shall not exceed the amount of additional pension payable for training under said part VII.

"8. No department, agency, or officer of the United States, in carrying out the provisions of this part, shall exercise any supervision or control, whatsoever, over any State educational agency, or State apprenticeship agency, or any educational or training institution: *Provided,* That nothing in this section shall be deemed to prevent any department, agency, or officer of the United States from exercising any supervision or control which such department, agency, or officer is authorized, by existing provisions of law, to exercise over any Federal educational or training institution, or to prevent the furnishing of education or training under this part in any institution over which supervision or control is exercised by such other department, agency, or officer under authority of existing provisions of law.

"9. The Administrator of Veterans' Affairs is authorized and empowered to administer this title, and, insofar as he deems practicable, shall utilize existing facilities and services of Federal and State departments and agencies on the basis of mutual agreements with them. Consistent with and subject to the provisions and limitations set forth in this title, the Administrator shall, from time to time, prescribe and promulgate such rules and regulations as may be necessary to carry out its purposes and provisions.

"10. The Administrator may arrange for educational and vocational guidance to persons eligible for education and training under this part. At such intervals as he deems necessary, he shall make available information respecting the need for general education and for trained personnel in the various crafts, trades, and professions: *Provided,* That facilities of other Federal agencies collecting such information shall be utilized to the extent he deems practicable.

"11. As used in this part, the term 'educacational or training institutions' shall include all public or private elementary, secondary, and other schools furnishing education for adults, business schools and colleges, scientific and technical institutions, colleges, vocational schools, junior colleges, teachers colleges, normal schools, professional schools, universities, and other educational institutions, and shall also include business or other establishments providing apprentice or other training on the job, including those under the supervision of an approved college or university or any State department of education, or any State ap-

prenticeship agency or State board of vocational education, or any State apprenticeship council or the Federal Apprentice Training Service established in accordance with Public, Numbered 308, Seventy-fifth Congress, or any agency in the executive branch of the Federal Government authorized under other laws to supervise such training."

SEC. 401. Section 3, Public Law Numbered 16, Seventy-eighth Congress, is hereby amended to read as follows:

"SEC. 3. The appropriation for the Veterans' Administration, 'Salaries and expenses, medical and hospital, and compensation and pensions', shall be available for necessary expenses under part VII, as amended, or part VIII of Veterans Regulation Numbered 1 (a), and there is hereby authorized to be appropriated such additional amount or amounts as may be necessary to accomplish the purposes thereof. Such expenses may include, subject to regulations issued by the Administrator and in addition to medical care, treatment, hospitalization, and prosthesis, otherwise authorized, such care, treatment, and supplies as may be necessary to accomplish the purposes of part VII, as amended, or part VIII of Veterans Regulation Numbered 1 (a)."

SEC. 402. Public Law Numbered 16, Seventy-eighth Congress, is hereby amended by adding thereto a new section 4 to read as follows:

"SEC. 4. Any books, supplies, or equipment furnished a trainee or student under part VII or part VIII of Veterans Regulation Numbered 1 (a) shall be deemed released to him: *Provided,* That if he fail, because of fault on his part to complete the course of training or education afforded thereunder, he may be required, in the discretion of the Administrator, to return any or all of such books, supplies, or equipment not actually expended or to repay the reasonable value thereof."

SEC. 403. Paragraph 1, part VII, Veterans Regulation Numbered 1 (a) (Public Law Numbered 16, Seventy-eighth Congress), is hereby amended by inserting after the word "time" the words "on or" and deleting the date "December 6, 1941" and substituting therefor the date "September 16, 1940."

[Titles 3-4-5 and 6 omitted.]

Approved June 22, 1944.

[PUBLIC LAW 16—78TH CONGRESS]
[CHAPTER 22—1ST SESSION]
[S. 786]

AN ACT

To amend title I of Public Law Numbered 2, Seventy-third Congress, March 20, 1933, and the Veterans Regulations to provide for rehabilitation of disabled veterans, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 1, title I, Public, Numbered 2, Seventy-third Congress, approved March 20, 1933, be amended by adding at the end thereof a new subsection known as subsection (f) and to read as follows:

"(f) Any person who served in the active military or naval forces on or after December 7, 1941, and prior to the termination of hostilities in the present war shall be entitled to vocational rehabilitation, subject to the provisions and limitations of Veterans Regulation Numbered 1 (a), as amended, part VII."

SEC. 2. Veterans Regulation Numbered 1 (a), as amended, is hereby amended by adding at the end thereof a new part to be known as part VII and to provide as follows:

"Part VII

"1. Any person who served in the active military or naval service at any time after December 6, 1941, and prior to the termination of the present war, who is honorably discharged therefrom, and who has a disability incurred in or aggravated by such service for which pension is payable under laws administered by the Veterans' Administration, or would be but for receipt of retirement pay, and is in need of vocational rehabilitation to overcome the handicap of such disability, shall be entitled to such vocational rehabilitation as may be prescribed by the Administrator of Veterans' Affairs to fit him for employment consistent with the degree of disablement: *Provided,* That no course of training in excess of a period of four years shall be approved nor shall any training under this part be afforded beyond six years after the termination of the present war.

"2. The Administrator shall have the power and duty to prescribe and provide suitable training to persons included in par-

agraph I, and for such purposes may employ such additional personnel and experts as are deemed necessary, and may utilize and extend existing Veterans' Administration facilities and utilize those of any other governmental agency as well as those maintained by joint Federal and State contribution; and, in addition, he may, by agreement or contract with public or private institutions or establishments, provide for such additional training facilities as may be suitable and necessary to accomplish the purposes of this part.

"3. While pursuing training prescribed herein, and for two months after his or her employability is determined, each veteran, if entitled to pension in an amount less than the amount payable in accordance with the compensation rates for total and temporary disability, including additional amounts for wife, husband, child, or children and dependent parents, provided by section 202, World War Veterans' Act, 1924, as amended (U. S. C., title 38, sec. 475), shall be paid increased pension which when added to the amount of pension to which he is otherwise entitled will aggregate an amount equal to such rates: *Provided,* That when the course of vocational rehabilitation furnished to any person as herein provided consists of training on the job by an employer, such employer shall be required to submit monthly to the Administrator a statement under oath showing any wage, compensation, or other income paid by him to such person during the month, directly or indirectly, and based upon such sworn statements, the Administrator is authorized to reduce the pension of such person to an amount considered equitable and just, but not below the amount of pension or retirement pay to which he would be entitled for service-connected disability if not following a course of vocational rehabilitation.

"4. Where any person while following a course of vocational rehabilitation as provided for in this part suffers an injury or an aggravation of any injury, as a result of the pursuit of such course of vocational rehabilitation, and not the result of his or her own willful misconduct, and such injury or aggravation results in additional disability to or death of such person, the benefits under laws applicable to veterans of the present war shall be awarded in the same manner and extent as if such disability, aggravation, or death were service-connected within the meaning of such laws; except that no benefits under this paragraph shall be awarded unless application be made therefor within two years after such injury or aggravation was suffered, or such death occurred.

"5. The purpose of rehabilitation is to restore employability lost by virtue of a handicap due to service-incurred disability. The Administrator shall have the power and duty to cooperate with and employ the facilities of other governmental and State employment agencies for the purpose of placing in gainful employment persons trained under the provisions of this part.

"6. The Administrator is hereby authorized to make such rules and regulations as may be deemed necessary in order to promote good conduct and cooperation on the part of persons who are following courses of vocational rehabilitation provided by this part. Penalties for the breach of such rules and regulations may, with the approval of the Administrator, extend to a forfeiture by the offender for a period of three months of such portion of the pension herein provided as will leave him not less than the amount of the monthly pension or retirement pay to which such person is entitled for service-connected disability, and such penalties may also extend to permanent discontinuance of all further benefits of this part.

"7. The Administrator is hereby authorized to make such rules and regulations as may be deemed necessary for the granting of leaves of absence to those following courses of vocational rehabilitation provided by this part where in his opinion such leaves do not materially interfere with the pursuit of such courses. Such leaves of absence shall not in the case of any person be granted in excess of thirty days in any consecutive twelve months except in exceptional circumstances as determined by the Administrator: *Provided,* That during leave of absence under this paragraph such person shall be considered to be pursuing his course of vocational rehabilitation under this part.

"8. There is hereby authorized to be appropriated, out of any money in the Treasury of the United States not otherwise appropriated, available immediately and until expended, the sum of $500,000 to be utilized by the Veterans' Administration under such

rules and regulations as the Administrator may prescribe, as a revolving fund for the purpose of making advancements not exceeding $100 in any case, to persons commencing or undertaking courses of vocational rehabilitation under this part, and advancement to bear no interest and to be reimbursed in such installments as may be determined by the Administrator by proper deductions from any future payments of pension or retirement pay.

"9. The Administrator shall have the power to provide courses of instruction for personnel and may detail employees to attend the same and may detail any such personnel to attend courses conducted by other than Veterans' Administration agencies, including private organizations, and such employees in addition to their salaries shall be entitled to the payment of expenses incident to such detail, including transportation and tuition, as the Administrator by rules and regulations shall provide; and also in his discretion, to make, or, as by agreement with other agency or institution, cause to be made studies, investigations, and reports inquiring into the rehabilitation of disabled persons and the relative abilities, aptitudes, and capacities of the several groups of the variously handicapped and as to how their potentialities can best be developed and their services best utilized in gainful and suitable employment, including the rehabilitation programs of foreign nations engaged in the present war. For this purpose he shall have the power to cooperate with such public and private agencies as he may deem advisable and to call in consultants who shall receive as compensation for their services a reasonable per diem, which the Administrator shall by rules and regulations provide, for each day actually spent in the work provided for herein and shall in addition be reimbursed for their necessary traveling and other expenses. For the purposes of this part, the Administrator may accept uncompensated services upon such agreement as he may deem feasible."

SEC. 3. The appropriations for the Veterans' Administration, "Salaries and expenses, medical and hospital, and compensation and pensions," shall be available for necessary expenses, including but not confined to necessary medical care, and pension payment, payment or reimbursement of expenses in connection with supplying suitable training under this Act; and there is hereby authorized to be appropriated such additional amount or amounts as may be necessary to accomplish the purposes of this Act.

Approved March 24, 1943.

COUNCIL ON DENTAL HEALTH

SUMMARY OF REPORTS RECEIVED FROM STATE COUNCILS ON DENTAL HEALTH

ILLINOIS

The annual meeting of the Committee on Dental Health Education of the Illinois State Dental Society was held in Springfield, July 30, 1944. The reports of the subcommittee on specific objectives and the subcommittee on health instruction indicated that considerable progress had been made in establishing health habits in elementary schools and in health instruction in teacher colleges. Recommendations for a dental health program in industry were submitted and approved. The industrial subcommittee was instructed to send a copy of the proposed program to all industrial organizations in the state.

The problem of replacing lost dental personnel in the state department of public health was discussed. It was decided to send letters to deans of dental schools in the state and to the district office of the U. S. Public Health Service requesting assistance in obtaining recent dental graduates who are not in military service.

An explanation of the new Illinois health and physical education law revealed that, as soon as practicable, physical examinations shall be required of all pupils in the public elementary and secondary schools, with exceptions as provided in the law, immediately prior to or upon their entrance into the first grade and again not less than every fourth year thereafter. Examinations shall be made by physicians and dentists licensed to practice in the state. Cumulative records of the examinations are to be kept on file by the school authorities.

The Illinois district dental societies reported the following progress in the Victory Corps program:

RESULTS OF ILLINOIS VICTORY CORPS PROGRAM (1943-1944)

County	Number of Schools Reporting	Enrollment	Number Graduated with Complete Dental Care	Number Under Treatment
Champaign	1	52	26	15
Cook	2	778	662	50
Du Page	3	328	123	66
Fulton	8	174	86	14
La Salle	1	158	15	27
Lee	1	149	65	2
Livingston	5	103	50	12
McDonough	4	79	29	8
Mercer	2	57	54	3
Rock Island	4	646	4	2
Tazewell	1	105	51	16
Vermilion	5	131	75	1
Whiteside	4	196	117	30
Will	8	757	436	105
Williamson	1	16	14	2
Total of 15 counties	50	3,729	1,807	353

G. V. Black Society: 64 high schools participating.

Champaign-Danville Society: Action delayed until society can obtain more information.

Chicago Society: All high schools participating; no major difficulties.

Decatur Society: Program in operation in majority of high schools.

Eastern Illinois Society: No report.

Fox River Society: No report.

T. L. Gilmer Society: One-third of high schools participating; some difficulties encountered.

Kankakee Society: No action reported.

Knox Society: No report.

La Salle Society: No report.

McLean Society: No report.

Madison Society: No report.

Northwest Society: No report.

Peoria Society: All four high schools participating.

Rock Island Society: No action reported.

St. Clair Society: No action reported.

Southern Illinois Society: No action reported.

Wabash River Society: No report.

Warren Society: No action reported.

Whiteside-Lee Society: One out of nine high schools participating; considerable difficulty encountered in establishing program.

Will-Grundy Society: Several high schools participating; difficulty reported.

Winnebago Society: No report.

Results of the Victory Corps program in Illinois for the 1943-1944 school year were as indicated in the accompanying table.

The dental profession has a greater responsibility than ever in continuing its efforts toward promotion of the Victory Corps Physical Fitness Dental Program. For the duration of the war, the immediate objective is to make high school seniors dentally fit to fulfil their obligations in the war effort. The postwar objective is to establish a friendly and effective working relationship among education, public health and dental groups on national, state and local levels. This will be of considerable aid in establishing permanent dental health programs in elementary and secondary schools. The Council on Dental Health of the American Dental Association urges early action in the Victory Corps program for the 1944-1945 school year.

ALLEN O. GRUEBBEL,
Executive Secretary

AMERICAN DENTAL ASSOCIATION
MEMBERS OF THE HOUSE OF DELEGATES 1944

DELEGATES AND ALTERNATES

ALABAMA

Delegates
Blue, J. A., Merchants Nat'l Band Building, Mobile
Kirkland, Olin, Shepherd Building, Montgomery
Allen, Hunter S., Comer Building, Birmingham

Alternates
Gillespy, J. S., Frank Nelson Building, Birmingham
Wood, W. A., Merchants Nat'l Bank Building, Mobile
McGavock, R. J., Woodward Building, Birmingham

ARIZONA

Delegates
Bruening, E. H., Los Ranchos Perkins, Tucson
Johnson, William J., Lois Grunow Memorial Clinic, Phoenix

Alternates

ARKANSAS

Delegates
Hunt, W. R., Clarksville
Sternberg, I. M., Merchants Bank Building, Fort Smith

Alternates
Gibbs, M. D., Medical Arts Building, Hot Springs
Cone, George, Jr., Osceola

CALIFORNIA STATE

Delegates
Soderstrom, Ernest P., Beaty Building, Modesto
Sloman, Ernest G., 344 14th St., San Francisco 3
Fleming, Willard C., 1906 Franklin St., Oakland 12
Kingsbury, Bernerd C., 490 Post St., San Francisco 2
Wagner, Ralph O., 431 13th St., Oakland 9
Gurley, John E., 350 Post St., San Francisco 8
Leggett, John W., 490 Post St., San Francisco 2
Robinson, Wilfred H., 1706 Broadway, Oakland 12
Charles A. Sweet, 2940 Summit St., Oakland

Alternates

SOUTHERN CALIFORNIA

Delegates
McLean, David W., 2585 Huntington Drive, San Marino
Vieille, Albert C., 3875 Wilshire Blvd., Los Angeles
Bleecker, Harry H., 5410 Wilshire Blvd., Los Angeles
Borland, Robert L., 756 S. Broadway, Los Angeles
Liscom, Jason L., 1930 Wilshire Blvd., Los Angeles
Thompson, Walter S., 727 West Seventh St., Los Angeles
Brownson, E. Ray, 3875 Wilshire Blvd., Los Angeles
Reagan, C. A., 1930 Wilshire Blvd., Los Angeles
Tylicki, B. M., 547 East Broadway, Long Beach
Steen, John F., Bank of America Building, San Diego
Woodward, Charles M., First Trust Building, Pasadena

Alternates
Paul, Cassius E., Moore Building, Santa Ana
McCollum, B. B., Professional Building, Los Angeles
Phillips, Everett J., 3123 W. Eighth St., Los Angeles
Campbell, James C., 316 S. Brand St., San Fernando
Kulstad, Hugo M., 698 Hollywood Bldg., Hollywood
Olds, Fred B., Roosevelt Building, Los Angeles
Webber, Chester H., Bank of America, San Diego
Stone, O. L., 3780 Wilshire Blvd., Los Angeles
Hart, H. P., 1625 Chelsea Road, San Marino

COLORADO

Delegates
Johnston, Lloyd W., Republic Building, Denver
Markley, M. R., Republic Building, Denver
Thurston, A. B., U. S. Bank Building, Grand Junction

Alternates
Dooner, A. J., Thatcher Building, Pueblo
Gilmore, R. F., Grand Junction
Brown, C. J., La Junta

CONNECTICUT

Delegates
Murren, John P., Medical Building, Bridgeport
Fitch, Avery F., 140 State St., New London
Arnold, Earle S., 37 Linnard Road, West Hartford
Brooks, Clarence G., 302 State St., New London
Hicks, Henry, 5 Glen Court, Greenwich
Coy, Harry C., 57 Pratt St., Hartford

Alternates
Quinn, Henry T., 55 Greenwich Ave., Greenwich
Siegal, Louis R., 750 Main St., Hartford
Vivian, Clifford W., 58 Elbridge Road, New Britain
Monks, Leon C., 781 Chapel St., New Haven
Harold, Frederic S., 291 Whitney Ave., New Haven
McLaughlin, William J., Medical Building, Bridgeport

DELAWARE

Delegate
Traynor, Philip A., 807 Washington St., Wilmington

Alternate
Nelson, Clyde A., Milford

DISTRICT OF COLUMBIA

Delegates
Burke, J. P., Colorado Building, Washington
Weakley, A. D., 1726 Eye St., N.W., Washington
Brown, James W., 1726 Eye St., N.W., Washington

Alternates
Glezen, Roy, Georgetown University Dental School, Washington
Swanson, Henry A., 1726 Eye St., N.W., Washington
Krogh, Harold, 1835 Eye St., N.W., Washington

FLORIDA

Delegates
Smith, A. M., Jr., 416 Tampa St., Tampa
Thompson, E. L., 326½ Beach St., Daytona Beach
Cartee, Horace L., Huntington Building, Miami
Harlow, Lloyd N., Hall Building, St. Petersburg

Alternates
Lunsford, E. C., 2742 Biscayne Blvd., Miami
Sears, A. W., Professional Building, Jacksonville
Wood, W. P., Jr., 443 W. Lafayette St., Tampa
York, F. M., 640 Beach Drive North, St. Petersburg

GEORGIA

Delegates
Mason, R. Holmes, Macon
Tuck, A. C., Walter Reed Hospital, Washington, D. C.
Mitchell, J. Russell, Candler Building, Atlanta
Banks, W. H., Montezuma

Alternates
Grant, T. A., 118 E. Jones St., Savannah
Routledge, John R., Rome
Weischselbaum, William, Savannah
Maxwell, V. L., Augusta

IDAHO

Delegates
Barkdull, Stewart, Station Hospital, Independence, Kan.
Gigray, W. F., Caldwell

Alternates
Johnston, Mose, Twin Falls
Ioset, R. G., Twin Falls

ILLINOIS

Delegates
Arganbright, N. A., State Bank Building, Freeport
McNulty, R. W., 1737 W. Harrison St., Chicago
Jacob, L. H., Jefferson Building, Peoria
Kesel, R. G., 808 S. Wood St., Chicago
Oppice, Harold W., 1002 Wilson Ave., Chicago
Zielinski, Joseph B., 3147 Logan Blvd., Chicago
Hartley, Harry A., 1525 E. Fifty-Third St., Chicago
Keith, James H., 636 Church St., Evanston
Humphrey, Robert I., 185 N. Wabash Ave., Chicago
Hughes, L. W., 30 N. Michigan Ave., Chicago
Cartwright, G. E., 4000 W. North Ave., Chicago
Welch, Harold W., 25 E. Washington St., Chicago
Farrell, F. A., Ferry Hall, Lake Forest
McNeil, William I., 59 E. Madison St., Chicago
Dodd, Lloyd H., Citizens Building, Decatur
Rost, T. A., Unity Building, Bloomington
Green, J. W., First Nat'l Bank Building, Springfield
Mahoney, J. E., Wood River
Tarpley, H. M., W. C. U. Building, Quincy
Moreland, H. A., Cairo
Acton, H. Lyle, Lawrence Building, Sterling
Gonwa, W. J., Chrisman
Blackman, Lloyd C., Professional Building, Elgin
Kartheiser, P. J., Graham Building, Aurora

Alternates
Snyder, C. L., Second Nat'l Bank Building, Freeport
Boulger, Earl P., 27 S. Pulaski Road, Chicago
Steward, L. E., 103 N. Madison Ave., Peoria
Schoen, William P., Jr., 6353 Broadway, Chicago
Placek, B., 1545 W. Division St., Chicago
Hurlstone, F. J., 30 N. Michigan Ave., Chicago
Wilher, J. L., 1305 E. Sixty-Third St., Chicago
McEwen, D. W., 4010 W. Madison St., Chicago
Mundell, R. B., 545 Lincoln Ave., Winnetka
Baumann, E. W., 108 N. Evergreen Ave., Arlington Heights
DeRose, Michael, 3643 Chicago Ave., Chicago
Ebert, Elmer, 10058 Ewing Ave., Chicago
Nowlan, J. W., 9453 S. Ashland Ave., Chicago
Rakow, Samuel M., 4010 W. Madison St., Chicago
Winter, Walter W., Citizens Building, Decatur
Brown, Harry C., Unity Building, Bloomington
Donelan, John J., United Mine Workers Building, Springfield
Hundley, R. A., 3915-a Waverly Ave., East St. Louis
Griebler, J. Ralph, Meredosia
Emerson, Harry, Breese
Sherrard, Ben H., Rock Island Bank Building, Rock Island
Horr, Elton C., Taylorville
Burt, Holmes C., Neustadt Building, LaSalle
Nicholson, R. G., Graham Building, Aurora

INDIANA

Delegates
Fonner, Lynn A., 1100 E. Creighton Ave., Fort Wayne
Carr, Guthrie P., Loan & Trust Building, Lafayette
Ewbank, E. E., Kingman
Bogie, William, American Nat'l Bank Building, Vincennes
Gillis, R. R., 134 Rimbach St., Hammond
Douglas, R. H., 506½ S. Second St., Elkhart
Crawford, William H., 1121 W. Michigan St., Indianapolis
Spears, A. A., Citizens Nat'l Bank Building, Brazil

Alternates
Longcamp, H. J., Gibson Building, Aurora
Mason, Herbert W., 658 Fairfield Ave., Indianapolis
Gilchrist, Earl S., 3740 Central Ave., Indianapolis
Miller, C. L., 1511 Miami St., South Bend
Baker, Frederick, 5231 Hohman St., Hammond
Mayfield, C. T., Armstrong-Landon Building, Kokomo
Guse, George E., 201 W. Third St., Rushville
Kelly, W. N., White's Pharmacy Building, Clinton

IOWA

Delegates
Humeston, A. M., Higley Building, Cedar Rapids
Foley, J. J., Physicians Building, Fort Dodge
Kennedy, J. B., Southern Surety Building, Des Moines
Hemsworth, L. C., Black Building, Waterloo
Stewart, C. H., Farragut
Henkin, Mort, New Orpheum Building, Sioux City
Pool, Hardy F., M. B. A. Building, Mason City

Alternates
Goen, D. J., Manchester
Anderson, Glenn C., Avoca
Hildebrand, John G., Blackhawk Building, Waterloo
Belding, P. H., Waucoma
Johnson, H. G., Laurel Building, Muscatine
Berner, H., Bennett Building, Council Bluffs
Sidwell, H. W., Villisca

KANSAS

Delegates
Buff, A. J., Mills Building, Topeka
Kramer, Leon R., Nat'l Reserve Building, Topeka
Robison, Homer B., Rorabaugh-Wiley Building, Hutchinson
Richmond, Fred A., Huron Building, Kansas City

Alternates
Alquist, L. E., Clay Center
Bunker, H. L., Junction City
Crawford, B. H., Council Grove
Teall, Gordon L., Hiawatha

KENTUCKY

Delegates
Hume, E. C., Francis Building, Louisville
Wilson, O. D., Masonic Building, Owensboro
Thomas, R. P., Francis Building, Louisville
Walker, J. L., 640 Barbee Way South, Louisville

Alternates
Curry, E. E., Winchester
Mauser, C. F., Evarts
Pearcy, C. S., Starks Building, Louisville
Van Antwerp, C. O., 2418 W. Market St., Louisville

LOUISIANA

Delegates
Alternates

MAINE

Delegates
Milne, Douglas M., 465 Congress St., Portland
Colwell, Harvard E., 209 Main St., Lincoln

Alternates
Young, Harry N., 630 Forest Ave., Portland
Thompson, Alvah C., 11 Deering St., Portland

MARYLAND

Delegates
Leonard, R. C., 2411 N. Charles St., Baltimore
Stone, E. D., Medical Arts Building, Baltimore
Anderson, G. M., 831 Park Ave., Baltimore
Smith, F. Noel, Medical Arts Building, Baltimore

Alternates
Bland, T. J., Medical Arts Building, Baltimore
Phillips, J. G., Professional Building, Baltimore
Broadrup, C. E., Frederick
Baklor, M. K., 2201 Eutaw Place, Baltimore

MASSACHUSETTS

Delegates
Wallace, John R., 1 Mt. Vernon St., Winchester
Mallett, Stephan P., 358 Commonwealth Ave., Boston
Kilkelly, Thomas F., 23 Center St., Middleboro
Adams, Philip E., 106 Marlborough St., Boston
Lawrence, Glenn W., 412 Beacon St., Boston
Grant, Frederick E., 603 High St., Dedham
Griffin, William H., 520 Beacon St., Boston
Cronin, Harold J., 739 Liberty St., Springfield
Hookway, Harold H., 10 High St., Boston
Rafferty, Andrew A., 390 Main St., Worcester
Miner, Leroy M. S., 363 Marlborough St., Boston
Trevor, Frederick A., 775 Main St., Boston

Alternates
Bryans, Walter J., 76 Park St., Lee
Soares, Edward L., 84 Spring St., New Bedford
Teasdale, George M., 227 Union St., New Bedford
Cheney, J. Edward, 717 Main St., Fitchburg
Peters, Maurice E., 60 Charlesgate West, Boston
Brown, George Cowles, 332 Main St., Worcester
Parks, William M., Parke-Snow Building, West Somerville
Morse, Edwin J., 77 Newbury St., Boston
Breen, John A., 506 Commonwealth Ave., Boston
Daley, Francis H., 1085 Boylston St., Boston

Gibbons, John J., 375 Commonwealth Ave., Boston
Shuman, Harry B., 29 Commonwealth Ave., Boston

MICHIGAN

Delegates
Andrews, L. H., 1600 Niles Ave., St. Joseph
Applegate, O. C., 216 S. State St., Ann Arbor
Beukema, J. P., Medical Arts Building, Grand Rapids
Davis, William R., Michigan Department of Health, Lansing
Goodsell, J. O., Second Nat'l Bank Building, Saginaw
Henry, F. J., 1170 Madison Ave., S.E., Grand Rapids
Jamieson, C. H., 8545 Gratiot Ave., Detroit
Jaxtimer, J. P., 15403 E. Jefferson Ave., Detroit
Matson, C. H., Dryden Building, Flint
McBride, W. C., Fisher Building, Detroit
Ward, M. L., 1308 Cambridge Road, Ann Arbor
Wertheimer, Fred, Michigan Department of Health, Lansing

Alternates
Applegate, S. G., 630 E. Jefferson Ave., Detroit
Brooks, G. R., First Nat'l Bank Building, Rochester
DeVilliers, M. S., 4400 Livernois Ave., Detroit
Diedrich, A. V., 14015 Gratiot Ave., Detroit
Easlick, K. A., 1508 Shadford Road, Ann Arbor
Lowery, P. C., 8545 Gratiot Ave., Detroit
Perry, Chester, 630 E. Jefferson Ave., Detroit
Prince, M. W., 7634 Dexter Blvd., Detroit
Seligson, David, Eaton Tower, Detroit
Shehan, H. L., Jackson City Bank Building, Jackson
Teal, D. M., 1 Mechanic St., Yale
Wright, J. K., State Bank Building, Traverse City

MINNESOTA

Delegates
Thom, L. W., 1546 Medical Arts Bldg., Minneapolis 2
Cruttenden, L. M., 498 Lowry Medical Arts Bldg., St. Paul 2
Ernst, M. E., 1250 Lowry Medical Arts Bldg., St. Paul 2
Flagstad, C. O., 1349 Medical Arts Bldg., Minneapolis 2
Gruesen, J. L., 602 Medical Arts Bldg., Duluth 2
Gyllenborg, L. C., 1445 Medical Arts Bldg., Minneapolis 2
McQueen, W. W., 805 Physicians & Surgeons Bldg., Minneapolis 2
Mee, T. J., 637 Medical Arts Bldg., Minneapolis 2
Merwin, O. J., 478 S. Snelling Ave., St. Paul 5
Millhon, J. A., Mayo Clinic, Rochester

Alternates
Cassel, C. V. E., 1111 Medical Arts Bldg., Duluth 2
Hedburg, R. L., 3004 Hennepin Ave., Minneapolis 2
Lusk, M. E., 1648 Medical Arts Bldg., Minneapolis 2
Pike, J. M., 811 Medical Arts Bldg., Minneapolis 2
Robertson, A. W., 40 S. Snelling Ave., St. Paul 5
Ulvestad, R. A., 919 Medical Arts Bldg., Minneapolis 2
Washburn, H. B., 488 Lowry Medical Arts Bldg., St. Paul 2
Webb, W. L., Fairmont
Werrick, J. P., 1915 Medical Arts Bldg., Minneapolis 2

MISSISSIPPI

Delegates
Abbott, Rush P., West Point
Williams, Fayette, Corinth

Alternates
Wells, C. M., Canton
Henderson, A. H., Greenville

MISSOURI

Delegates
Purcell, T. E., 3556 Caroline St., St. Louis
Brandhorst, O. W., 4952 Maryland St., St. Louis
Jones, A. H., Paul Brown Building, St. Louis
Owen, E. B., Frisco Building, St. Louis
Pollock, H. C., 8020 Forsythe Blvd., Clayton
Frost, R. W., Bryant Building, Kansas City
White, W. W., Plaza Bank Building, Kansas City
Rinehart, R. J., Tenth & Troost Ave., Kansas City
Miller, Jesse, Maryville
Mense, R. C., Hannibal

Alternates
Marré, J. M., Missouri Theatre Building, St. Louis
Rode, R. B., Frisco Building, St. Louis
Shanley, L. M., 7800 Maryland Ave., St. Louis
Strake, F. A., 3606 Gravois Ave., St. Louis
Alcorn, J. F., 3720 Washington Blvd., St. Louis
Dillon, E. L., Professional Building, Kansas City
Eversull, F. H., 315 Alameda Road, Kansas City
Gates, L. M., 116 W. Forty-Seventh St., Kansas City
Sparks, L. P., Moberly
Hill, R. H., Columbia

MONTANA

Delegate
Vedova, E. G., Roundup

Alternate

NEBRASKA

Delegates
Pierson, F. A., Federal Securities Building, Lincoln
Hunt, L. T., Security Mutual Building, Lincoln
King, H. E., Medical Arts Building, Omaha
Leonard, F. W., 2707½ Thirteenth St., Columbus

Alternates
Bumstead, C. A., Stuart Building, Lincoln
Colgan, J. G., McCook
Fellers, E. W., Arcade Building, Beatrice
Lillibridge, C. C., Crete

NEVADA

Delegate
Steinmiller, George C., Box 2473, Reno

Alternate

NEW HAMPSHIRE

Delegates
Gallagher, Thomas, Concord
King, Robert R., Keene

Alternates
Keane, E. F., Newport
Sargent, Robert E., Bristol

NEW JERSEY

Delegates
Newman, Eugene W., 16 Wallace St., Red Bank
Jennings, E. J., 126 W. State St., Trenton
Devlin, Gerard A., 49 Bleeker St., Newark
Crowe, Charles P., 521 Main St., East Orange
Carr, John G., U. S. Naval Training Station, Bainbridge, Md.
Houghton, Frank J., 50 Glenwood Ave., Jersey City
Hopper, Craft A., 534 Broadway, Paterson
Roeck, Ernest C., 367 Washington Ave., Belleville
Weber, Paul M., Citizens Nat'l Bank Building, Englewood
Hanley, James L., 586 Central Ave., East Orange
Reese, Sylvanus F., Weymouth & Atlantic Aves., Ventnor
Connell, Bertrand T., 26 Journal Square, Jersey City

Alternates
Samuel, James H., Record Building, Morristown
Peplow, Edward H., 42 W. State St., Trenton
Schweikhardt, C. J., 68 Belmont Ave., Newark
Rosenast, Emil O., 130 North Broadway, Camden
Rosenwasser, Benjamin, 4809 Bergenline Ave., Union City
Giordano, James V., 425 Union Ave., Paterson
Lyons, Stephen M., 382 Springfield Ave., Summit
Greenwald, Louis E., 20 W. Palisade Ave., Englewood
Schneider, E. J. H., 319 Prospect Ave., Maplewood
Whitehill, Norman J., 1904 Pacific Ave., Atlantic City
Quirk, Pierce A., 921 Bergen Ave., Jersey City.

NEW MEXICO

Delegate
Mullings, D. A., First Nat'l Bank Building, Albuquerque

Alternate
Claffey, F. J., Santa Fe

NEW YORK

Delegates
Abbey, Leon L., 619 Union St., Schenectady
Adams, Fred R., 55 W. Forty-Second St., New York
Bell, Willard S., 118-02 Rockaway Blvd., Ozone Park
Bicklehaup, A. C., State Tower Building, Syracuse

Burgun, Joseph A., 142 Joralemon St., Brooklyn
Burkhart, Harvey J., P. O. Box 879, Rochester
Burns, Gerald G., 133 Clinton Ave. South, Rochester
Carter, John H., 143 Mohawk St., Cohoes
Citron, Louis, 199 Main St., White Plains
Clug, Bernard, 17 Park Ave., New York
Cullen, Thomas R., W. First St., Oswego
Douglass, George C., 80 Hanson Place, Brooklyn
Flynn, John T., Harwood Building, Scarsdale
Glaser, Joseph M., 137-01 Jamaica Ave., Jamaica
Gordon, William F., 3005 Grand Concourse, New York
Guenther, John A., 1003 E. Genesee St., Buffalo
Heinze, Robert L., No. 1 Hanson Place, Brooklyn
Howland, Wells, 122 Front St., Binghamton
Isaacson, S. A., 501 Madison Ave., New York
King, Edward C., Seneca Building, Ithaca
Merritt, Arthur H., 580 Fifth Ave., New York
Montgomery, W. Ray, 675 Delaware Ave., Buffalo
Mork, Waldo H., 501 Madison Ave., New York
Moss, Harry M., 57 W. Fifty-Seventh St., New York
Neuber, Augustave, 619 Union St., Schenectady
Phillips, Percy T., 1705-18 E. Forty-Eighth St., New York
Schenk, Worthington G., 468 Delaware Ave., Buffalo
Schuyler, Clyde H., 400 Madison Ave., New York
Tench, Russell W., 745 Fifth Ave., New York
Whitson, Glenn H., 80 Hanson Place, Brooklyn
Zillmann, Paul W., 29 Walden Ave., Buffalo

Alternates
Brophy, Frederick H., 200 W. Fifty-Ninth St., New York
Brown, Harold O., 19 East Ave., Rochester
Burns, William McGill, 11 W. Forty-Second St., New York
Chase, Oscar J., 140 E. Fifty-Fourth St., New York
Eisner, Samuel, 853 Broadway, New York
Gale, E. Harold, 142 Washington Ave., Albany
Gallagher, Robert A., 401 Main St., Batavia
Hardy, Irving R., 9 Rockefeller Plaza, New York
Hayes, Merrick, 77 Broad St., Tonawanda
Hitzelberger, A. C., 14 Hopper St., Utica
Holt, Stanley N., 7 South St., Middletown
Johnson, Gustaf B., 1 Hanson Place, Brooklyn
Jones, Paul, 89 East Ave., Rochester
Morris, J. Harold, Station B., Poughkeepsie
Muir, William M., 26 W. Main St., Gowanda
Nobert, O. F., 176 W. Dominick St., Rome
Podoloff, Samuel, 7 State St., Schenectady
Rea, Floyd G., 142 Joralemon St., Brooklyn
Reisman, Harry, 40 Monroe St., New York
Shapiro, Simon, 142 Joralemon St., Brooklyn
Tracy, Martin C., 9 Rockefeller Plaza, New York
Van Valey, E. G., 38 E. Sixty-First St., New York
Webb, William R., Jr., 3441 Seventy-Ninth St., Jackson Heights
Wilkie, Charles A., 1 Hanson Place, Brooklyn
Winter, Gordon R., 81 Front St., Binghamton
Wolpert, H. Donald, Bewley Building, Lockport

NORTH CAROLINA

Delegates
Lineberger, H. O., Raleigh
Fitzgerald, Paul, Greenville
Jones, Paul E., Farmville
Jackson, Wilbert, Clinton

Alternates
Alford, Frank O., First Nat'l Bank Building, Charlotte
Maddux, N. P., Asheville
Sinclair, J. A., Asheville
Edwards, Z. L., Washington

NORTH DAKOTA

Delegates
Smith, John W., White Building, Jamestown
Stangebye, R. L., Mott

Alternates
Morris, K. W., Bismarck
Blunt, J. K., Bismarck

OHIO

Delegates
Pryor, W. J., Rose Building, Cleveland
Wolford, W. H., Farmers Bank Building, Mansfield
Ball, E. L., Doctors Building, Cincinnati
Jones, E. G., 185 E. State St., Columbus
Black, F. W., Doctors Building, Cincinnati
Postle, W. D., 1714 N. High St., Columbus
Bach, E. N., Professional Building, Toledo
Way, T. I., 1701 South Boulder, Tulsa, Okla.
McDermott, T. J., Rose Building, Cleveland
Gentilly, J. V., Rose Building, Cleveland
Jarvis, H. C., Mercantile Library Building, Cincinnati
Hebble, C. H., 327 E. State St., Columbus
Mills, E. C., 255 E. Broad St., Columbus
Hurst, W. W., 2165 Adelbert Road, Cleveland
Schott, C. H., Neave Building, Cincinnati

Alternates
Wylie, W. L., 2165 Adelbert Road, Cleveland
Aufderheide, P. J., Rose Building, Cleveland
Pettibone, E. L., 14805 Detroit Ave., Lakewood
Gregg, C. C., Rittman
Sargeant, W. S., Nicholas Building, Toledo
Dalton, V. B., 116 Garfield Place, Cincinnati
Stricker, C. H., Doctors Building, Cincinnati
Pursell, F. M., Second Nat'l Bank Building, Akron
Longfellow, J. C., Bellefontaine
Young, O. M., Marion
Stephan, J. F., Keith Building, Cleveland
Outland, G. H., 12 W. Seventh St., Cincinnati
Adair, W. G., 3823 Glenway Ave., Cincinnati
Heibert, A. C., Second Nat'l Bank Building, Akron

OKLAHOMA

Delegates
Warrick, H. O., Box 773, Enid
Ratliff, J. R., Hobart
Wise, Eugene W., Medical Arts Building, Tulsa

Alternates
Dunn, Robert M., Medical Arts Building, Tulsa
Pitney, Fred O., Medical Arts Building, Oklahoma City
Hess, Charles A., Durant

OREGON

Delegates
Bettman, M. M., Medical Arts Building, Portland 5
Fixott, H. C., Medical-Dental Building, Portland 5
Harris, M. C., Tiffany Building, Eugene
Walrath, H. C., Selling Building, Portland 5
Miller, H. C., North Pacific College of Oregon, School of Dentistry, Portland 14
Schwering, C. L., Miner Building, Eugene

Alternates

PANAMA

Delegate
Alternate

PHILIPPINE ISLANDS

Delegate
Alternate

PUERTO RICO

Delegate
Alternate

PENNSYLVANIA

Delegates
Cooper, H. K., 26 N. Lime St., Lancaster
Ennis, Leroy M., 4001 Spruce St., Philadelphia
Luckie, S. Blair, 333 E. Broad St., Chester
Miller, A. H., 299 Wyoming Ave., Kingston
Willits, H. K., 750 N. Tenth St., Reading
Bomberger, Paul E., 116 E. Chestnut St., Lancaster
Nesbit, M. D., 403 Market St., Lewisburg
Miller, Fred D., 1122 Twelfth Ave., Altoona
Crosby, J. M., I. O. O. F. Building, Bradford
Balthaser, J. B., 549 W. Eighth St., Erie
Friesell, H. E., University of Pittsburgh Dental School, Pittsburgh
Timmons, Gerald D., 1808 Spring Garden St., Philadelphia
Metz, H. C., Highland Building, Pittsburgh
Lawson, A. S., 524 Federal St., Pittsburgh
Meisel, E. G., 121 University Place, Pittsburgh
Wright, Walter H., 1306 Penn Ave., Wilkinsburg
Hoeffer, F. H., 230 N. Fifth St., Reading
Robinson, W. J., 4906 Walnut St., Philadelphia
Mendel, W. E., 405 E. Ohio St., Pittsburgh
Harkins, C. S., Box 176, Osceola Mills
McCready, W. A., Highland Building, Pittsburgh
Ross, John W., 1520 Spruce St., Philadelphia

Alternates
Archer, W. Harry, Professional Building, Pittsburgh
Fricke, C. R., 401 Butler Street, Etna, Pittsburgh
Marcus, M. B., Central Medical Building, Philadelphia
Hess, J. G., 34 E. Walnut St., Lancaster
Everhard, W. D., Calder Building, Harrisburg
Strayer, E. R., Spruce Street Medical Building, Philadelphia
Ventura, A. L., 333 DeKalb St., Morristown
Brunner, M. D., 47 Long Lane, Upper Darby
Forbes, J. W., Medical Arts Building, Philadelphia
Cohen, Abram, Spruce Street Medical Building, Philadelphia
Cross, A. J., Box 101, Freedom
Craig, W. Earle, Jenkins Arcade, Pittsburgh
Eaton, M. P., 4005 Chestnut St., Philadelphia
Reichard, H. C., Riant Theater Building, Conshohocken
Levy, Saul, Medical Arts Building, Scranton
Brennan, N. C., 13 S. Main St., Shenandoah
Young, George W., 707 N. Second St., Harrisburg
Whittaker, J. E., 301 Washington Blvd., Williamsport
Crouse, H. M., Johnstown Trust Building, Johnstown
Wenk, Karl E., New Cohn Block, Kane
O'Leary, J. Y., 121 University Place, Pittsburgh
Young, J. Y., Girard

RHODE ISLAND

Delegates
Chune, Thomas W., 1282 Cranston St., Cranston
Albert, Archie A., 84 Broad St., Pawtucket

Alternates
Midgley, Albert L., Union Trust Building, Providence
Fortier, Norman H., 935 Main St., Pawtucket

SOUTH CAROLINA

Delegates
Dick, George W., Sumter
Douglas, C. M., State Hospital, Columbia

Alternates
Lentz, Frank O., Bennettsville
Hair, P. B., Spartanburg

SOUTH DAKOTA

Delegates
Elmen, Ernest W., Sioux Falls
Richards, F. C., Bridgewater

Alternates
Whitney, H. C., Wessington Springs
May, M. J., Rapid City

TENNESSEE

Delegates
Taylor, E. W., Exchange Building, Memphis
Elam, Roy O., Dental Unit 11, Newport N. T. S., Newport, R. I.
Sharp, J. G., Medical Arts Building, Knoxville
Brooks, W. B., Hamilton Nat'l Bank Building, Chattanooga

Alternates
Towner, Justin D., Exchange Building, Memphis
Oliver, Oren A., Medical Arts Building, Nashville
Alford, W. C., Medical Arts Building, Knoxville
Sullivan, D. A., Cleveland

TEXAS

Delegates
Hays, Stuart E., Medical Arts Building, San Antonio
Hicks, C. J., McKinney
Talbot, W. O., Trinity Life Building, Fort Worth
Holder, B. Carl, Nixon Building, Corpus Christi
Rogers, R. L., Medical & Professional Building, Amarillo
Newton, Walter T., Esperson Building, Houston
Elliott, F. C., 1018 Blodgett Ave., Houston
Ogle, Willard, Medical Arts Building, Dallas

Alternates
Ranfranz, O. E., Medical Arts Building, Houston
Garrison, B. W., Medical Arts Building, Fort Worth
Parker, M. L., First Nat'l Bank Building, El Paso
Snider, R. D., Medical Arts Building, Houston
Brock, Sam H., Medical Arts Building, Dallas
Edwards, J. T., Medical Arts Building, Fort Worth
Ellington, E. O., Box 1076, Big Spring
Garrison, Monte R., Hamilton Building, Wichita Falls
O'Farrell, J. D., Medical Arts Bulding, Houston

UTAH

Delegates
Green, C. G., Boston Building, Salt Lake City
Halgren, L. O., First Nat'l Bank Building, Salt Lake City

Alternates
Pack, Eugene M., Eccles Building, Ogden
Jones, Preston L., Nephi

VERMONT

Delegates
Taggart, C. I., Burlington
Johnson, Norman F., Rutland

Alternates

VIRGINIA

Delegates
Hodgkin, M. N., Warrenton
Bear, Harry, Professional Building, Richmond
John, J. E., Medical Arts Building, Roanoke
Gilmer, W. S., Pulaski

Alternates
Chevalier, Paul L., Professional Building, Richmond
Muir, N. F., Shenandoah Life Bulding, Roanoke
Snapp, R. B., 201 Fairmont Ave., Winchester
Garrard, C. K., Allied Arts Building, Lynchburg

WASHINGTON

Delegates
Barlow, T. M., Bellingham Nat'l Bank Building, Bellingham
Williams, George D., Paulsen Building, Spokane
Foote, L. L., Medical & Dental Building, Seattle
Martin, A. L., Medical & Dental Building, Seattle

Alternates

WEST VIRGINIA

Delegates
Boydston, W. J., Box 508, Fairmont
Summers, H. E., First Nat'l Bank Building, Huntington
Cleek, L. D., Charleston

Alternates
Sturm, Ward T., 108 Adams St., Fairmont
Poindexter, J. B., Professional Building, Huntington
Douglass, E. D., Parkersburg

WISCONSIN

Delegates
Hardgrove, T. A., Fond du Lac
Moen, O. H., Watertown
Martin, F. J., Medford
Bull, F. A., 3887 N. Eighteenth St., Milwaukee
Morgan, G. E., 2039 N. Prospect Ave., Milwaukee
Donovan, J. M., Neenah
Mason, R. A., 964 N. Twenty-Seventh St., Milwaukee
Casey, L. J., Chippewa Falls
Le Sage, G. A., 1320 Tower Ave., Superior
Baumgartner, J. F., West Bend
Cavanaugh, M. G., 4630 W. Burleigh St., Milwaukee

Alternates
Justin, J. P., 2250 W. Capitol Drive, Milwaukee
Frisch, J. G., 110 E. Main St., Madison
Hansen, M. C., Arcade Bulding, Racine
Collins, C. P., 625 Fifty-Seventh St., Kenosha
Hanson, Gordon H., 111½ E. Grand Ave., Eau Claire
Plater, W. R., Tenney Building, Madison
Mortell, J. F., Oshkosh
Nelson, C. A., Amery
Schaller, William H., Brunder Building, Milwaukee
Newbury, W. J., Burlington
Murphy, F. J., New London

WYOMING

Delegate
O'Malley, H. A., Rock Springs

Alternate
King, G. S., Casper

ARMY

Delegate
Bull, Terry P., 7th Service Command, New Federal Building, Omaha, Nebr.

Alternate
Gaynor, Clement J., Jefferson Barracks, Mo.

NAVY

Delegate
A. G. Lyle, U. S. Naval Medical Supply Depot, Sands and Pearl Sts., Brooklyn, N. Y.

Alternate
R. S. Davis, Bureau of Medicine and Surgery, Navy Dept., Washington, D. C.

VETERANS ADMINISTRATION

Delegate
Fowler, Milburn M., Dental Division, Veterans Administration, Washington, D. C.

Alternate
Swift, Lionel V., Veterans Administration Facility, Hines, Ill.

U. S. PUBLIC HEALTH SERVICE

Delegate
Wright, William T., Jr., U. S. Public Health Service, Washington, D. C.

Alternate
Knutson, John W., U. S. Public Health Service, Washington, D. C.

DEATHS

BARNHILL, S. T., Las Cruces, N. M.; University of Lousiville, School of Dentistry, 1909; died July 26.

BATTLE, COOPER MALONE, Memphis, Tenn.; Vanderbilt University, School of Dentistry, 1909; died August 10.

BRADFORD, FENTON, Washington, D. C.; Columbian University, Dental Department, Washington, 1897; died August 13.

BRUNET, J. L., Minneapolis, Minn.; Chicago College of Dental Surgery, 1904; died April 21; aged 74.

BURG, OSCAR, Minneapolis, Minn.; died August 14; aged 76.

BYRNES, BENIJAH S., Memphis, Tenn.; died August 21; aged 90.

COLEMAN, PAUL SHOFNER, Nashville, Tenn.; died July 20; aged 67.

CONLIN, FRANK J., Pittsfield, Mass.; Temple University School of Dentistry, 1913; died August 16; aged 60.

COOK, CHARLES W., Pennsylvania Dental College, Philadelphia, 1895; died July 26; aged 81.

DAVIS, W. L., Grass Valley, Calif.; died July 14; aged 74.

DEMPSEY, HARRISON, Napa, Calif.; Indiana University School of Dentistry, 1899; died June 19; aged 73.

DENIRO, ROMEO A., Youngstown, Ohio; University of Pittsburgh, School of Dentistry, 1925; died August 4; aged 44.

DOWNS, SAMUEL J., Richfield Springs, N. Y.; New York College of Dentistry, 1891; died August 6; aged 81.

DUSINBERRE, A. B., Ithaca, N. Y.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1919; died July 10; aged 47.

FAHRENHOLZ, W. L., St. Louis, Mo.; St. Louis University School of Dentistry, 1921; died June 24; aged 49.

FISHER, A. T., Evanston, Ill.; Northwestern University Dental School, 1903; died August 23; aged 68.

FORD, CECIL B., Peoria, Ill.; Meharry Dental College, Dental Department of Meharry Medical College, 1918; died July 31.

FRIEDMAN, SAMUEL, Brooklyn, N. Y.; died August 12; aged 67.

GENUNG, GEORGE E., Osage, Iowa; Western Dental College, 1900; died June 23; aged 68.

GODDEN, CHARLES SAMUEL, Washington, D. C.; Howard University, College of Dentistry, 1920; died May 13.

GOLLADAY, MILFORD, Bowie, Texas; Western Dental College, Kansas City, 1902; died June 24; aged 65.

GREENBERG, ADOLPH, Middletown, N. Y.; died July 30; aged 73.

HUSSEY, ISAAC F., Springfield, Ohio; died August 1; aged 82.

JONES, E. LESTER, Albany, N. Y.; University of Buffalo, School of Dentistry, 1917; died August 2; aged 51.

KELLY, JOHN H., Wentzville, Mo.; St. Louis University School of Dentistry, 1917; died July 21; aged 53.

KOHANIK, EUGENIA D., Passaic, N. J.; University of Pittsburgh, School of Dentistry, 1913; died August 18; aged 51.

LEADBETTER, MARK I., Barnesboro, Pa.; University of Pittsburgh, School of Dentistry, 1917; died August 3; aged 48.

LEFKOWITZ, SAMUEL, Cleveland, Ohio; died August 17 at Camp Maxey, Texas; aged

41. Dr. Lefkowitz was a captain in the U. S. Army Dental Corps.

LEVY, JESSE, St. Paul, Minn.; University of Minnesota, College of Dentistry, 1899; died June 9; aged 67.

LIFSEY, TRUMAN, West Palm Beach, Fla.; Atlanta Dental College, 1903; died August 13; aged 61.

LONG, LESLIE P., Louisville, Ky.; University of Louisville, School of Dentistry, 1895; died June 23; aged 72.

MCCALL, NOBLE T., Arkansas City, Kan.; Western Dental College, Kansas City, 1914; died June 29; aged 55.

MCCARTER, WILLIAM A., Tulsa, Okla.; Kansas City Dental College, 1887; died August 11; aged 85.

MCLAUGHLIN, GEORGE S., New Brunswick, N. J.; Philadelphia Dental College, 1901; died August 6; aged 64.

MCMAHON, DANIEL J., Washington, D. C.; Georgetown University, School of Dentistry, 1919; died August 19.

MANCHESTER, FRANK S., Canton, Ohio; Western Reserve University, School of Dentistry, 1903; died July 28; aged 68.

MANES, CHARLES SIDNEY, Patchogue, L. I., N. Y.; College of Dental and Oral Surgery of New York, 1917; died July 25; aged 52.

MARLER, JOHN G., Yadkinville, N. C.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1901; died August 2; aged 76.

MARVEN, EDGAR W., Lynn, Mass.; Baltimore College of Dental Surgery, 1892; died August 6; aged 79.

MENZIES, W. P., San Angelo, Texas; died July 19; aged 74.

MONSON, CARLTON I., Beverly Hills, Calif.; School of Dentistry, University of Denver, 1917; died August 12; aged 51.

MORGAN, N. E., Atlanta, Ga.; Atlanta Dental College, 1915; died August 18; aged 69.

NEVARD, SAUL D., Peekskill, N. Y.; died July 31.

NICHOLS, DON CELLON, Battle Creek, Mich.; University of Michigan, College of Dental Surgery, 1911; died August 6; aged 58.

PADBERG, ALOYSIUS J., St. Louis, Mo.; St. Louis University of Dentistry, 1910; died July 14.

PESCH, THEODORE, Rochester, Minn.; Chicago College of Dental Surgery, 1916; died February 23.

PFAFF, HENRY, St. Louis, Mo.; Northwestern University Dental School, 1899; died July 18; aged 64.

PLATT, HARRY M., Houston, Texas; Texas Dental College, Houston, 1913; died July 5; aged 74.

PROWIZOR, NATHAN, Minneapolis, Minn.; University of Minnesota, School of Dentistry, 1925; died May 16; aged 45.

PURVIS, GEORGE F., Chicago, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1919; died August 13; aged 46.

RARDEN, W. L., Greenville, Mich.; University of Michigan, College of Dental Surgery, 1905; died August 8; aged 63.

READ, HARRY S., Flint, Mich.; University of Michigan, College of Dental Surgery, 1913; died July 21; aged 56.

RICHARDS, WALTER, Slatington, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1898; died August 2.

RICKEL, WILLIAM E., Columbus, Ohio; Ohio Medical University, College of Dentistry, 1900; died August 14; aged 74.

ROTH, IRVING S., Jersey City, N. J.; State University of Iowa, College of Dentistry; died of wounds received in action in Normandy July 20; aged 36. Dr. Roth was a captain in the U. S. Army Medical Corps.

ROUNDTREE, PLEMON M., New York, N. Y.; died July 19.

RUGE, MARX, Valparaiso, Ind.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1898; died August 9; aged 66.

SCHEELE, HARRY A., Clayton, Mo.; died July 31.

SHOEMAKER, EDITH B., Daytona Beach, Fla.; died July 3; aged 69.

SIBBETT, CLIFFORD E., Cincinnati, Ohio; Cincinnati College of Dental Surgery, 1892; died August 10.

SMITH, DAVID ANDREW, Shadyside, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1894; died July 31.

SPRAGUE, DANIEL E., Minneapolis, Minn.; University of Minnesota, College of Dentistry, 1900; died February 28; aged 66.

STITZ, OSCAR I., Chicago, Ill.; Northwestern University Dental School; died August 26.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION OF DENTAL EDITORS, Chicago, Ill., October 17.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS, New York, N. Y., October 2.

AMERICAN COLLEGE OF DENTISTS, Chicago, Ill., October 18.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Chicago, Ill., October 16-18.

AMERICAN DENTAL ASSOCIATION, Chicago, Ill., October 16-18.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Chicago, Ill., October 16-18.

AMERICAN DIETETIC ASSOCIATION, Chicago, Ill, October 25-27.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York, N. Y., October 3-5.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York, N. Y., October 23.

AMERICAN SOCIETY FOR ORAL SURGEONS, Chicago, Ill., October 12-14.

UNIVERSITY OF BUFFALO DENTAL ALUMNI ASSOCIATION, Buffalo, October 10-12.

DETROIT DISTRICT DENTAL SOCIETY, Detroit, Mich., November 9.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second Tuesday in each month, at the Medical Society Auditorium, Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS, Toledo, Ohio, October 23-24.

HAWAII TERRITORIAL DENTAL SOCIETY, Honolulu, October 26-28.

MID-CONTINENT DENTAL CONGRESS, St. Louis, Mo., October 30-November 1.

MID-CONTINENT DENTAL COUNCIL, St. Louis, Mo., October 30-November 1.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC, October 25-27.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS, Chicago, Ill., October 14-15.

NATIONAL BOARD OF DENTAL EXAMINERS, December 4-5.

GREATER NEW YORK DENTAL MEETING, December 4-8.

NEW YORK INSTITUTE OF CLINICAL ORAL PATHOLOGY, New York, N. Y., October 30.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 13-14.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, October 17-19.

PAST PRESIDENTS' CLUB, Chicago, Ill., October 17.

PRESIDENT'S DINNER, Chicago, October 17.

PSI OMEGA DINNER, Chicago, October 16.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, N. Y., October 18.

STATE SOCIETIES

November

Ohio, at Columbus (12-15)

February 1945

Minnesota, at Minneapolis (27-March 1)

March 1945

Wisconsin (19-21)

April 1945

Michigan, at Detroit (16-18)
Oklahoma, at Oklahoma City (15-18)

May 1945

Illinois, at Peoria (7-10)
Massachusetts, at Boston (14-17)
Mississippi, at Jackson (6-8)
Vermont, at Burlington (23-24)

June 1945

Washington, at Spokane, (21-23)

STATE BOARDS OF DENTAL EXAMINERS

Arizona, at Phoenix, October 9. R. K. Trueblood, 25 N. Second Ave., Glendale, Secretary.

California, at San Francisco, November 6. Kenneth I. Nesbett, 515 Van Ness St., San Francisco 2, Secretary.

Connecticut, at Hartford, November 14-18. C. G. Brooks, New London, Recorder.

Indiana, at Indianapolis, December 11-14. C. A. Frech, 504 Broadway, Gary, Secretary.

Maine, at Augusta, October 2-4. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

New Jersey, October 2-5. J. Frank Burke, 150 E. State St., Trenton, Acting Secretary.

Ohio, at Columbus, October 9-11 (practical examination for dental candidates); at Columbus, October 12-14 (theory examinations for dental and dental hygiene candidates); at Columbus, October 10 (practical examination for dental hygiene candidates). Earl D. Lowry, 79 E. State St., Columbus, Secretary.

South Carolina, at Columbia, October 2-4. T. C. Sparks, 1508 Washington St., Columbia 23, Secretary.

Texas, at Dallas, November 27-30. R. T. Weber, 311 Norwood Bldg., Austin 16, Secretary.

Virginia, at Richmond, October 24. John M. Hughes, Medical Arts Bldg., Richmond, Secretary.

AMERICAN ASSOCIATION OF DENTAL EDITORS

THE American Association of Dental Editors will hold a luncheon meeting at the Stevens Hotel, Chicago, October 17. Members are urged to be present.

O. W. BRANDHORST, *Secretary.*

AMERICAN ASSOCIATION OF ENDODONTISTS

THE objects of the American Association of Endodontists are (1) to promote the interchange of ideas on methods of pulp conservation and root-canal treatment; (2) to promote research studies, both clinical and laboratory, among its members; (3) to assist in establishing local root-canal study clubs, and (4) to help maintain a high standard of root-canal practice within the dental profession by disseminating information through lectures, clinics, publications, etc. Although it is not the object of the organization to promote root-canal therapy as a specialty of dentistry, specialization in this field by any of its members will not be discouraged. Those interested may apply for an application for membership to

LOUIS I. GROSSMAN, *Secretary,*
4001 Spruce St.,
Philadelphia 4, Pa.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS

THE American Association of Public Health Dentists will hold its annual meeting October 2 at the Hotel Pennsylvania, New York, N. Y.

AMERICAN COLLEGE OF DENTISTS

THE Board of Regents of the American College of Dentists will meet with the representatives of the sections October 18 at 7:30 p.m., in the Stevens Hotel, Chicago. All Fellows of the College will be welcome.

O. W. BRANDHORST, *Secretary.*

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE twentieth annual session of the American Dental Assistants Association will be held in Chicago, October 16-18, at the La-Salle Hotel.

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.
Jamaica Plain 30, Mass.

AMERICAN DENTAL ASSOCIATION

THE next meeting of the House of Delegates of the American Dental Association will be held in Chicago, Ill., October 16-18.

HARRY B. PINNEY, *Secretary,*
222 East Superior St.,
Chicago 11, Ill.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE twentieth annual meeting of the House of Delegates and Board of Trustees of the American Dental Hygienists' Association will be held in Chicago, October 16-18, with headquarters at the Stevens Hotel.

A. REBEKAH FISK, *Secretary,*
1704 N. Troy St.
Arlington, Va.

AMERICAN DIETETIC ASSOCIATION

THE annual meeting of the American Dietetic Association will be held at the Palmer House, Chicago, Ill., October 25-27. The sessions will be devoted to discussion of plans and problems relating to food and nutrition in connection with the war. Topics will include progress of the acceleration program to increase the number of qualified dietitians; improvement in methods in teaching student nurses; recruitment of dietitians

for the Army; administrative food problems; newer developments in diet therapy; maternal and child nutrition; school lunch problems; rationing and food supplies; labor policies in food service units, and technology of foods. Details will be released as they develop.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE Executive Board of the American Public Health Association announces the Second Wartime Public Health Conference and the seventy-third annual business meeting in New York, N. Y., October 3-5. Meetings of related organizations will take place October 2. Headquarters, Hotel Pennsylvania. The scientific program will be devoted to wartime emergency matters as they affect public health. The chairman of the Local Committee in Charge of Arrangements is Ernest L. Stebbins, M.D., health commissioner of New York City. The chairman of the program committee is Reginald M. Atwater, M.D.

WILLIMINA RAYNE WALSH,
Associate Secretary,
1730 Broadway,
New York 19, N. Y.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE fall meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held October 23 at the Hotel McAlpin, New York. George F. Seeman, president, of Nashville, Tenn., will preside. Dinner will be served at 7 p.m. at the McAlpin, with the scientific session at 8:30. M. Hillel Feldman, New York, will speak on the every-day problems in the field of general anesthesia in dental surgery. Members of the profession are invited.

M. HILLEL FELDMAN, *Secretary,*
730 Fifth Ave.,
New York, N. Y.

AMERICAN SOCIETY OF ORAL SURGEONS

THE twenty-sixth annual meeting of the American Society of Oral Surgeons will be held in Chicago, October 12-14.

HARRY BEAR, *Secretary,*
410 Professional Bldg.
Richmond, Va.

UNIVERSITY OF BUFFALO DENTAL ALUMNI ASSOCIATION
(Change of Dates)

THE forty-third annual meeting of the University of Buffalo Dental Alumni Association will be held October 10-12 at the Hotel Statler, Buffalo. The Eighth District Dental Society of the State of New York is cooperating in preparation of the program. Members of the profession are invited.

EDGAR L. RUFFING, *Chairman,*
Press & Publications,
233 West Ferry St.,
Buffalo.

DETROIT DISTRICT DENTAL SOCIETY

THE Third Annual Dental Review of the Detroit District Dental Society will be held at the Hotel Statler, Detroit, November 9. Limited attendance clinics will be held at 10, 2 and 4 o'clock, with dinner at 6, followed by table clinics and movies.

R. W. WALMOTH, *Chairman,*
4421 Woodward Ave.,
Detroit 1, Mich.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE District of Columbia Dental Society holds its meetings on the second Tuesday of every month, at the Medical Society Auditorium, 1718 M. St., N.W., Washington.

J. WALTER BERNHARD, *Secretary,*
1835 Eye St., N.W.,
Washington.

GREAT LAKES SOCIETY OF ORTHODONTISTS

THE next meeting of the Great Lakes Society of Orthodontists will be held October 23-24 at the Commodore Perry Hotel, Toledo, Ohio.

C. EDWARD MARTINEK, *Secretary,*
661 Fisher Bldg.,
Rochester, N. Y.

HAWAII TERRITORIAL DENTAL SOCIETY

THE fifth annual meeting of the Hawaii Territorial Dental Society will be held at the Mabel Smyth Memorial Building, Honolulu, October 26-28.

JOHN H. DAWE, *Secretary,*
P. O. Box 39
Honolulu 10.

MID-CONTINENT DENTAL CONGRESS

THE annual Mid-Continent Dental Congress, sponsored by the St. Louis Dental Society, will be held at the Hotel Jefferson, October 30-November 1.

HENRY F. WESTHOFF, *Chairman,*
Publicity Committee,
Missouri Theater Bldg.,
St. Louis, Mo.

MID-CONTINENT DENTAL COUNCIL

A SPECIAL invitation to attend the Mid-Continent Dental Council at St. Louis October 30-November 1 is extended to those dentists serving in the armed forces who are at this time stationed in the United States. Those planning to attend are requested to contact Capt. K. C. Marshall, O'Reilly General Hospital, Springfield, Mo., so that suitable arrangements may be made.

RALPH B. RODE, *President.*

TWENTIETH ANNIVERSARY—MONTREAL FALL CLINIC

THE program for the 20th anniversary meeting, which will be held on October 25, 26 and 27 is rapidly taking form, and at this point would appear to be well up to the standard set by previous meetings. Among the clinicians appearing on the program will be: R. O. Dingman, Ann Arbor, Mich., "Oral Surgery"; E. R. Granger, Mount Vernon, N. Y., "Oral Diagnosis"; R. D. Sommer, Ann Arbor, Mich., "Root Canal Therapy"; S. A. MacGregor, Toronto, Ontario, "Children's Dentistry."

It is anticipated that several clinicians and essayists from the Canadian Dental Corps will also participate in the program, through the courtesy of Brig. F. M. Lott, Director General of Dental Service. Further details of the program will appear in the near future.

Table clinics, group clinics, educational films and a large and diversified commercial exhibit will round out the program.

Any dentist, in good standing, who is not on the mailing list of the Montreal Dental Club and who wishes to obtain further particulars on this meeting should forward his name and address to the chairman.

M. L. DONIGAN,
1414 Drummond Street,
Montreal, Canada.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS

THE next annual meeting of the National Association of Dental Examiners will be held in the Council Room of the Stevens Hotel, October 14-15.

R. P. THOMAS, *Secretary,*
Francis Bldg.,
Louisville, Ky.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next sessions for the examination of candidates in Part 1 and 2 December 4-5 in schools where there are five or more candidates. Applications should come through the deans. For further information, address

GORDON L. TEALL, *Secretary,*
Box 71,
Hiawatha, Kan.

GREATER NEW YORK DENTAL MEETING

THE twentieth annual Greater New York Dental Meeting will be held December 4-8, at the Hotel Pennsylvania, New York City. Comprising the program are twenty-four morning registered clinics, twenty afternoon registered clinics, forty-five table clinics and thirty topic discussions; with thirty-two speakers, seven on medical-dental subjects, and twenty-six visual education films. The dental manufacturers, supply houses and laboratories will have exhibits of the newest materials and equipment available. Programs will be available in early November. Dentists in attendance should bring with them their A.D.A. membership cards to avoid confusion in registering.

NEW YORK INSTITUTE OF CLINICAL ORAL PATHOLOGY, INC.

THE first open meeting of the New York Institute of Clinical Oral Pathology will be held in Hosack Hall, New York Academy of Medicine, New York City, October 30 at 8:15 p.m. Arthur H. Merritt will preside at a symposium on "Fluorine in Dental Public Health," in which the following will participate: Frederick S. McKay, Colorado Springs, Colo.: "Fluorine and Mottled Enamel: A Historical Survey." H. Trendley

Dean, senior dental surgeon, U.S.P.H.S., Bethesda, Md.: "Epidemiology of Fluorosis and Dental Caries." Wallace D. Armstrong, associate professor of physiologic chemistry and director of laboratory of dental research, University of Minnesota, Minneapolis: "The Fluorine Content of Enamel in Relation to Resistance of Teeth to Caries." Basil G. Bibby, dean of Tufts Dental College: "Effects of Topical Application of Fluorides in Dental Caries." David B. Ast, assistant director for oral hygiene, State of New York Department of Health, Division of Maternity, Infancy and Child Hygiene: "Practicability, Efficacy and Safety of Fluorinating a Common Water Supply Deficient in Fluorine to Control Dental Caries."

For further information, address

G. ROISTACHER, *Executive Secretary,*
101 E. 79th St.,
New York 21, N. Y.

NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 13-14.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE Odontological Society of Western Pennsylvania will hold its annual meeting at the William Penn Hotel, Pittsburgh, October 17-19.

W. EARLE CRAIG, *Secretary,*
Suite 206, Jenkins Bldg.,
Pittsburgh 22.

PAST PRESIDENTS' LUNCHEON, A.D.A.

THE Past Presidents' Club of the American Dental Association will hold its annual luncheon at 12:30, Tuesday, October 17 at the Stevens Hotel, Chicago. The annual address will be delivered by Arthur C. Wherry, with Wilfred H. Robinson presiding. Every Past President is urgently requested to join with his colleagues, who, like himself, have contributed of time and effort in developing the various activities of the Association to their present recognized importance as an integral and essential phase of health service in civilian and military life.

HOMER C. BROWN, *Secretary,*
1816 Franklin Ave.,
Columbus 9, Ohio.

PRESIDENT'S DINNER

THE dinner in honor of the retiring President of the American Dental Association will be given at the Stevens Hotel October 17 in the North Ball Room at 7 o'clock. The affair is "stag" and informal.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE Women's Dental Society of New York announces the first meeting of the year, which is to be held at the Pennsylvania Hotel October 18 at 8 p. m. Courses are being offered to members in many phases of dentistry without charge. The members will meet for dinner preceding the meeting, at the Cafe Rouge at 6:30.

MATHILDA FREUND,
Publicity Chairman,
418 Harwood Bldg.,
Scarsdale.

ILLINOIS STATE DENTAL SOCIETY

THE next meeting of the Illinois State Dental Society will be held May 7-10 at the Pere Marquette Hotel, Peoria.

L. H. JACOB, *Secretary,*
634 Jefferson Bldg.,
Peoria 2.

MASSACHUSETTS DENTAL SOCIETY

THE 1945 meeting of the Massachusetts Dental Society will be held at the Statler Hotel, Boston, May 14-17.

P. E. ADAMS.

MICHIGAN STATE DENTAL SOCIETY

THE eighty-ninth annual meeting of the Michigan State Dental Society will be held April 16-18 at the Hotel Statler, Detroit.

S. G. APPLEGATE,
General Chairman,
630 E. Jefferson Ave.,
Detroit.

MINNESOTA STATE DENTAL ASSOCIATION

THE sixty-second annual session of the Minnesota State Dental Association will be held in the Municipal Auditorium, Minneapolis, February 27-March 1.

L. M. CRUTTENDEN, *Secretary,*
498 Lowry Medical Arts Bldg.,
St. Paul.

MISSISSIPPI DENTAL ASSOCIATION

THE Mississippi Dental Association will hold its next annual meeting in Jackson at the Robert E. Lee Hotel, May 6-8.

O. L. COLEE, *Secretary,*
Magnolia.

OHIO STATE DENTAL SOCIETY

THE seventy-ninth annual meeting of the Ohio State Dental Society will be held in the Neil House Hotel, Columbus, November 12-15. "Clinics for the general practitioner" have been arranged under four heads: table, limited attendance, question and answer discussions and exhibitors'. There will be the usual entertainment features. All A.D.A. members are invited.

EDWARD C. MILLS, *Secretary,*
255 E. Broad St.,
Columbus.

OKLAHOMA STATE DENTAL SOCIETY

THE Oklahoma State Dental Society will hold its 1945 meeting in Oklahoma City April 15-18.

E. W. WISE, *Secretary.*

VERMONT STATE DENTAL SOCIETY

THE next annual meeting of the Vermont State Dental Society will be held at the Van Ness Hotel, Burlington, May 23-24.

WASHINGTON STATE DENTAL ASSOCIATION

THE next meeting of the Washington State Dental Association will be held at Spokane, June 21-23.

G. D. WILLIAMS, *President,*
511 Paulsen Bldg.,
Spokane.

WISCONSIN STATE DENTAL SOCIETY

THE 1945 meeting of the Wisconsin State Dental Society, the Diamond Jubilee, will be held March 19-21, 1945.

ARIZONA STATE DENTAL BOARD

THE next examinations to be conducted by the Arizona State Dental Board will be held in Phoenix commencing October 9. All credentials must be in the office of the secretary by September 25. Address all communications to

R. K. TRUEBLOOD, *Secretary,*
25 N. Second Ave.,
Glendale.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

THE next examination to be conducted by the Board of Dental Examiners of California for licensure in California will commence November 6 at the Physicians and Surgeons College of Dentistry, San Francisco. Applications should be filed with the office of the secretary at least twenty days before the examination. Address all correspondence to

KENNETH I. NESBETT, *Secretary,*
515 Van Ness Ave.,
San Francisco 2.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford November 14-18 for the examination of applicants for license to practice dentistry or dental hygiene. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

C. G. BROOKS, *Recorder,*
New London.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Indiana State Board of Dental Examiners will be held in Indianapolis, December 11-14. All applications must be in the hands of the secretary at least two weeks prior to the date of examination. For applications or information, address

C. A. FRECH, *Secretary,*
504 Broadway,
Gary.

MAINE STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the State Board of Dental Examiners of Maine will be held in the State House, Augusta, October 2-4. Applications with necessary fee must be in the hands of the secretary at least ten days before the date of the examination. Address all communications to

CARL W. MAXFIELD, *Secretary,*
31 Central St.,
Bangor.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY

THE State Board of Registration and

Examination in Dentistry of New Jersey will hold its next regular examinations commencing October 2 and continuing for three days. A copy of the requirements and rules, instruction sheet and preliminary application will be sent upon request to the secretary. Candidates must file the preliminary application blank, together with the examination fee of $25, on or before September 1. Future schedules will be announced.

J. FRANK BURKE, *Acting Secretary,*
150 E. State St.,
Trenton 8.

OHIO STATE DENTAL BOARD

THE practical examination of the Ohio State Dental Board will be held at Ohio State University College of Dentistry, Columbus, October 9-11. The practical examination for dental hygiene candidates will be held October 10 at Ohio State University College of Dentistry, Columbus. The theory examination for both dental and dental hygiene applications will be held in Columbus, October 12-14. All applications for these examinations must be in the hands of the secretary not later than September 28 and no application will be accepted after that date. For further information, apply to

EARL D. LOWRY, *Secretary,*
79 E. State St.,
Columbus.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE South Carolina State Board of Dental Examiners will hold its next meeting in Columbia, October 2-4. All applications must be filled out and returned to the secretary at least thirty days before the date on which the examinations are to begin.

T. C. SPARKS, *Secretary,*
1508 Washington St.,
Columbia 23.

TEXAS STATE BOARD OF DENTAL EXAMINERS

THE Texas State Board of Dental Examiners will hold an examination in Dallas November 27-30, with headquarters at the Baker Hotel. Because this period includes the Thanksgiving holiday, the usual order will be reversed, the practical part of the examination being given the first two days and the written the last two. The deadline for accepting applications is October 27. Application blanks and additional information will be furnished on application to the Executive Office, 311 Norwood Bldg., Austin 16.

R. T. WEBER, *Secretary.*

VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE next regular meeting of the Virginia State Board of Dental Examiners will be held at the Medical College of Virginia, Richmond, beginning at 9 a.m., October 24, instead of September 19 as formerly announced. No applications will be accepted after October 7. Incomplete applications will be declined and returned. For application blanks and further information, apply to

JOHN M. HUGHES, *Secretary,*
715 Medical Arts Bldg.,
Richmond.

ALPHA OMEGA

ALL Massachusetts members of Alpha Omega in service, both in this country and abroad, are requested to communicate with Abraham Gurvitz, War Service Committee, Alpha Omega Fraternity, 371 Commonwealth Ave., Boston 15, Mass.

SAMUEL S. HIRSON, *Secretary,*
Boston Alumni Chapter,
471 Commonwealth Ave.,
Boston, Mass.

DENTAL INTERNSHIPS AND FELLOWSHIPS

THE Walter G. Zoller Memorial Dental Clinic, University of Chicago, offers rotating internship appointments. The clinic maintains four divisions of service: 1. The Zoller Clinic in Billings Hospital for all types of dental service. 2. The University Dental Clinic in Billings Hospital for diagnosis and minor oral surgery. 3. The Prenatal Dental Clinic in Chicago Lying-In Hospital for general service. 4. The Orthopedic Dental Clinic in the Home for Destitute Crippled Children for general dentistry. In addition to clinical practice, the intern is assigned to the department of anesthesia for instruction in the administration of general anesthetics. Opportunity is afforded to witness major surgical procedures about the face and jaws.

The Zoller clinic offers fellowships to those who desire advanced training in the basic sciences and who wish to equip them-

selves for dental teaching and research. Appointments carry liberal stipends and free tuition.

Interns and fellows have the privilege of attending all departmental seminars. Those interested should write for application blanks to the Director, Walter G. Zoller Memorial Dental Clinic, University of Chicago, Chicago 37, Ill.

INTERNSHIP AND VOLUNTEER EXTERNSHIPS

THERE is an internship, as well as several volunteer externships, available for recent graduates in the Dental Department of the Bronx Hospital. Opportunity is offered for training and experience in oral surgery and exodontia, orthodontia, periodontia, endodontia (root-canal therapy) and operative dentistry. Application forms can be obtained by communicating with S. Berton Gerstner, Director, Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx 56, N. Y.

DENTAL INTERNSHIPS

Two internships are available at the St. Louis City Hospital for recent dental graduates. Opportunity is afforded for training and experience in dental and oral surgery, diagnosis and other phases of dentistry. Applicants should address Leo J. Wade, Medical Director, or Hamilton B. G. Robinson, D.D.S., City Hospital, 1515 Lafayette Ave., St. Louis, Mo.

DENTAL INTERNSHIPS

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental services, would like to aid those men seeking dental internships in hospitals in the metropolitan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary,*
386 Fourth Ave.,
New York, N. Y.

DENTAL INTERNSHIPS

AN internship is available to a recent dental graduate at the Research and Educational Hospital of the University of Illinois Medical Center. An unusual opportunity is afforded for training and experience in hospital dentistry and the medical aspects of dental diseases. Application forms can be obtained from the Dean, University of Illinois College of Dentistry, 808 South Wood St., Chicago 12, Ill.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid in dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interests, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
Rochester, N. Y.

FEDERAL POSITIONS FOR DENTAL HYGIENISTS

THE United States Civil Service Commission is continuing to recruit dental hygienists for federal positions. Experience is no longer necessary.

Completion of a full course leading to graduation from a recognized school of oral hygiene and registration as a dental or oral hygienist in a state, territory or the District of Columbia will qualify applicants.

Students enrolled in schools of oral hygiene may apply for federal positions when they are within nine months of completion

of the course and may enter on duty on completion and registration. There are no age limits for the positions and no written tests. Appointees receive $1,970 a year entrance salary, which incorporates compensation for the eight hours of overtime included in the present forty-eight hour federal work week. The majority of positions are in Army hospitals and dispensaries throughout the country, particularly in the West and Southwest. Vacancies may occur also in the Veterans Administration and the Public Health Service. Applications should be filed with the Civil Service Commission, Washington 25, D. C.

W. C. HULL, *Executive Assistant,*
United States Civil Service Commission,
Washington, D. C.

POSTGRADUATE COURSE IN ROENTGENOLOGY

THE College of Dentistry of Ohio State University offers an additional postgraduate course in roentgenology, beginning September 25-29.

WENDELL D. POSTLE, *Dean,*
Columbus 10, Ohio.

DENTAL HYGIENE COURSE

A NEW course will be offered for dental hygienists at Ohio State University, beginning with the autumn quarter, October 3. The requirements for admission are the same as for admission to the College of Arts and Science. This is a two year course, leading to a certificate of graduate dental hygienist. The fee is $50 per quarter.

WENDELL D. POSTLE, *Dean,*
Columbus 10, Ohio.

CHICAGO DENTAL SOCIETY FOURTH ANNUAL PRIZE ESSAY COMPETITION

To encourage continued scientific research in all phases of dentistry, the Chicago Dental Society again offers a cash prize of $500 to the author of the most meritorious essay reporting an original investigation and containing new and significant material of value to dentistry.

The winner of the award will be invited to present his essay at the eighty-first Midwinter Meeting of the Chicago Dental Society, to be held in Chicago during February 1945. The expenses of the winner will be paid by the society and will be in addition to the prize of $500.

Any member of the American Dental Association or of a recognized foreign dental society, or any one affiliated with a recognized institution in the dental field may apply for authorization to enter the competition. The contest is not limited to research men having technical staffs and elaborate equipment at their disposal, but is open to any qualified person who believes that he has something new and important to contribute to dentistry. The rules are simple and fair and all contestants, whether students, teachers or practitioners, have an equal opportunity.

Application forms and contest rules can be obtained by writing to the Chicago Dental Society, 30 N. Michigan Ave., Chicago 2, Ill. All applications must be filed in the office of the society by October 2, 1944.

PRIZE ESSAY CONTEST, AMERICAN ASSOCIATION OF ORTHODONTISTS

THE Research Committee of the American Association of Orthodontists is empowered by the board of directors to conduct a prize essay contest. The prize has been set at $200 and will be offered annually until further notice. The terms of the competition are as follows:

Eligibility: Any student enrolled in a recognized university, or any person who has completed his or her formal education in orthodontia not more than two years prior to January 1, 1945, is eligible to compete for the prize.

Essay: The essay must represent a piece of original research having a direct bearing on the field of orthodontia. It may relate either to a biologic or a clinical problem and may represent material that has been offered in partial fulfilment of the requirements of a graduate or postgraduate degree, or any graduate, postgraduate or undergraduate contest. No papers previously submitted for publication or in press will be accepted. All essays must be in the hands of the committee not later than two months prior to the annual meeting of the association. Consult the periodic literature for this date. If no essay is deemed worthy by the committee, the prize will be withheld.

Award: The prize-winning essay will be accorded a place on the scientific program

of the annual meeting of the association, at which time the prize will be awarded. The association will retain publication rights of the first three choices. For further information, address

ALLAN G. BRODIE, *Chairman,*
Research Committee, A.A.O.
30 North Michigan Ave.,
Chicago 2, Ill.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS, REGULAR NAVY

THE next examination for appointment as Assistant Dental Surgeon, U. S. Navy (lieutenant, junior grade, Dental Corps, U. S. Navy) will be held at the Naval Training Station, Norfolk, Va., the Naval Training Center, Great Lakes, Ill., the Naval Training Center, San Diego, Calif., and the Naval Dental School, National Naval Medical Center, Bethesda, Md., October 16. Application for this examination should be made to the chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D. C. Applicants for appointment as Assistant Dental Surgeon must be citizens of the United States, more than 21, but less than 32 years of age at the time of acceptance of appointment and graduates of a class A dental school. A circular of information listing physical and other requirements for appointment, subjects in which applicants are examined and other data pertaining to salary, allowances, etc., can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C., on request.

COURSE OF INSTRUCTION IN INDUSTRIAL HYGIENE

COLUMBIA UNIVERSITY, through the DeLamar Institute of Public Health, announces intensive instruction in the dental aspects of industrial hygiene during the week beginning December 11. The curriculum is intended for those responsible for or interested in the dental aspects of industrial hygiene, for dentists already working in this field and for those who foresee the probability of being associated with future developments in this phase of dental practice. Instruction therefore is designed to introduce the dentist to the general field of industrial hygiene and to give him an appreciation of the entire problem of industrial health so that he may better integrate the dental aspects of this subject in the general industrial health program. Members of the DeLamar Institute of Public Health, the School of Dental and Oral Surgery and others from the College of Physicians and Surgeons, Columbia University, with guest lecturers, will constitute the faculty. Attendance will be limited to twenty-five. Persons other than dentists, in exceptional circumstances, may be admitted. Applications will be considered in the order received. The registration fee will be $25. For further information, address the Director, DeLamar Institute of Public Health, 600 W. 168 St., New York 32, N. Y.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING JULY 1944

July 4

2,352,678, ROBERT C. ANGELL. Adjustable chair.

2,352,691, DAVID CURTIS. Anesthetic compound and preparation.

2,352,808, IVAR E. SIQVELAND. Amalgam carrier.

D-138,180, SAMUEL GORDON. Design for a dental plate container.

July 11

2,353,339, NATHAN JANCO. Centrifugal casting machine.

2,353,517, ABRAHAM N. SPANIEL and WILLIAM F. DESTER. Brush cover.

July 18

2,353,747, JAMES D. MORRISON. Dental matrix retainer.

2,353,963, MORRIS LANDESMAN. Folding toothbrush.

July 25

2,354,452, RICHARD V. FOREGGER. Anesthetic apparatus.

2,354,454, SAMUEL H. GEFFNER. Dental floss holder.

2,354,626, NORTON L. WHEELER. Apparatus for mixing dental cement.